

IETF 66th - AUTOCONF WG

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Automatic configuration of IPv6 addresses for MANET with multiple gateways (AMG)

draft-ruffino-manet-autoconf-multigw-03

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AMG overview

- ▶ **General-purpose, stateless solution for AUTOCONF**
 - ▶ **Designed for MANETs with multiple gateways announcing multiple prefixes**
- ▶ **Overview:**
 - ▶ **Nodes use ULAs as MLAs**
 - ▶ **Proactive gateway discovery: GWs periodically flood prefix advertisements to all MANET nodes**
 - ✓ **MANET nodes build a set of global addresses (GA) and apply a ranking algorithm to it, using gateways metric, to choose which address to use for traffic**
 - ✓ **Nodes advertise the built GAs back in the MANET**

Design goals

- ▶ **Applicable to many connectivity scenarios**
 - ▶ **In particular, to dynamic ones, where gateways can abruptly disappear**
 - ▶ **And where global address can frequently change**
- ▶ **Performance and robustness**
 - ▶ **Exploitation of all available gateways**
- ▶ **No special mechanisms required in the Internet**
 - ▶ **And, no unnecessary load on the gateways**
- ▶ **Lightweight address uniqueness check**
- ▶ **Re-use of all existing protocols/mechanisms developed in MANET WG**
 - ▶ **Focus on AUTOCONF protocol functionalities**

Design choices

- ▶ **Use of ULA as MANET-local addresses**
 - ▶ draft-jelger-autoconf-mla-00 proposes 56+64 bits ULA random address: high probability of uniqueness
- ▶ **DAD is not specified**
 - ▶ AMG could be integrated with a Address Conflict Detection mechanism (passive preferred)
- ▶ **Different gateways advertise different prefixes, hence nodes can configure multiple addresses**
 - ▶ No coordination needed among gateways
 - ▶ RFC 3633 can be use to automatically delegate prefixes to GWs
 - ▶ *Issue: nodes' choice of source address affects the downstream data path within the MANET*
 - ▶ *Best Prefix Selection algorithm introduced*

Design choices (cont.)

- ▶ To minimize latency after an address change occurs, *Global Addresses Advertising introduced*

- ▶ Use of an external flooding engine (e.g. SMF) to announce prefixes within the MANET

- ▶ Use of RP messages to advertise nodes' addresses
 - ▶ Because RP is responsible to install routes on the nodes

- ▶ Use of Generalized Packet/Message Format
 - ▶ Optimized for MANET and extendible

Phase I : MANET-local address configuration

- ▶ **At bootstrap, nodes and gateways**
 - ▶ **build one ULA**
 - ▶ **configure it on one of their interfaces participating to MANET routing.**
- ▶ **Other MANET interfaces can be configured with ULA as well, but nodes must choose one of their MANET-local addresses as main address and activate the SMF process.**
- ▶ **MANET-local address should be used as originator address in routing protocol messages.**

Phase II: Prefix Advertisement

- ▶ Gateways periodically advertise prefixes in Prefix Advertisement (PA) messages using SMF
 - ▶ PAs include validity time for prefixes
- ▶ PAs conform to the generalized message format, as specified in draft-ietf-manet-packetbb-00

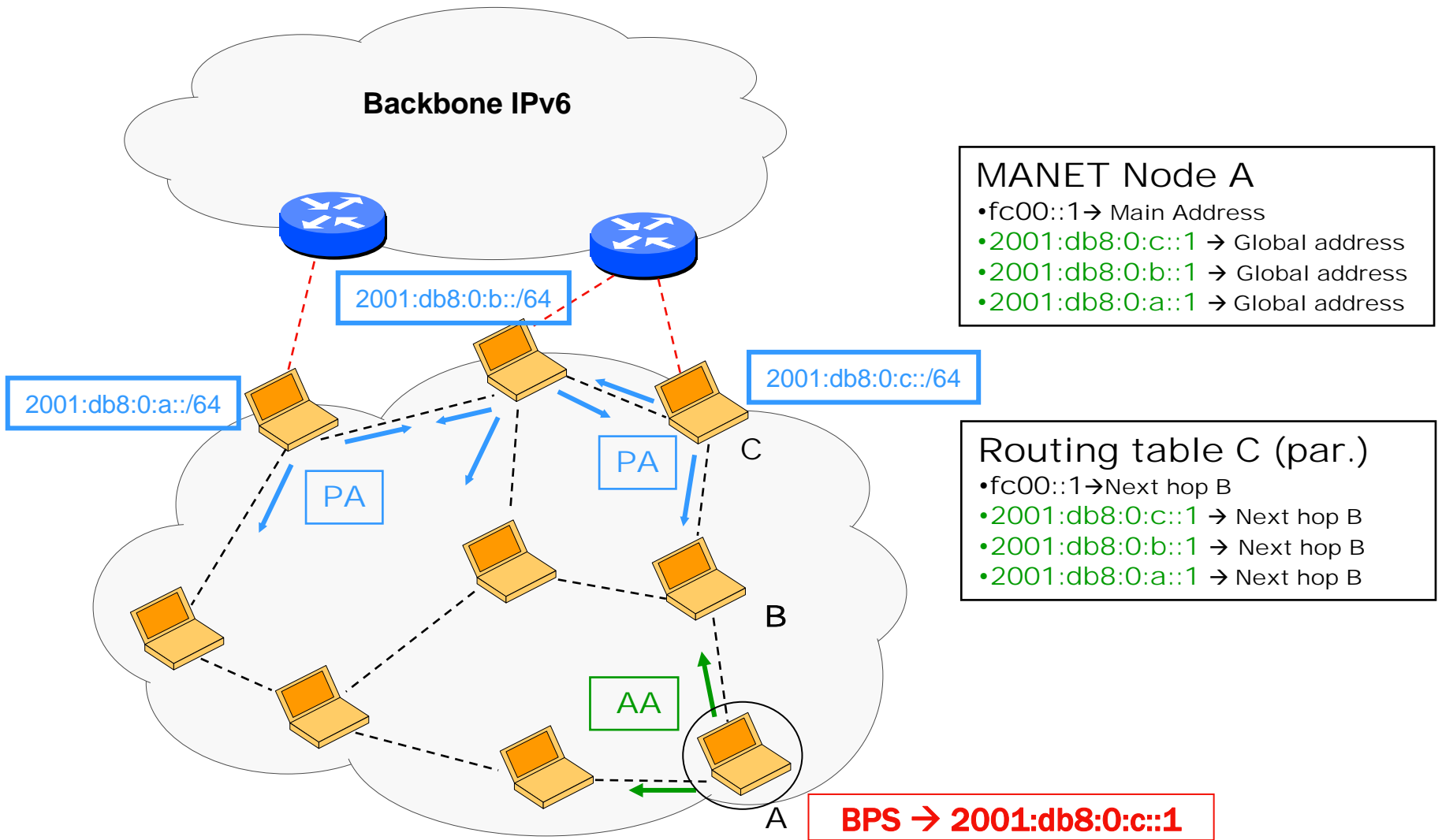
Phase III: Global Address Configuration

- ▶ **Nodes receive prefixes, carried in PAs, and build global address**
 - ▶ **They can configure one or more global addresses on interfaces**
- ▶ **Nodes rank Global Addresses applying Best Prefix Selection (BPS) algorithm**
 - ▶ **Goal: to provide hints on the “best” address to use as SA**
 - ▶ **It can use metric associated with Gateways, if available, taken from the Routing Table**
 - ▶ **Two alternative algorithms:**
 - ▶ **Default Gateway method: nodes always choose prefix announced by the default gateway**
 - ▶ **Threshold method: nodes don't change their ranking, unless current best gateway metric decreases below a threshold**

Phase IV: Global Addresses Advertising

- ▶ **Nodes advertise built global addresses to other MANET nodes**
 - ▶ **All or a subset (to decrease overhead)**
- ▶ **Other MANET nodes bind each other node's MANET-local address with the global addresses owned by each node.**
 - ▶ **Routes to global addresses of a node are available to all other MANET nodes (in particular, to gateways)**
- ▶ **DYMO, OLSRv1 and OLSRv2 can already support advertisement of multiple addresses, belonging to a single node**
 - ▶ **OLSRv1 can use MIDs, OLSRv2 can use TCs, DYMO can use RMs (for further study)**
 - ▶ **No new transport mechanism defined**

AMG



Best Prefix Selection

- ▶ **BPS should be executed at bootstrap AND when particular events trigger a topological change in the MANET.**
 - 1. Failure of the gateway owning the chosen prefix;**
 - 2. A partition, after which the node and the gateway, owning the chosen prefix, belong to two different MANETs;**
 - 3. A merging occurs, after which a gateway previously not connected to the MANET may have a better metric value;**
 - 4. The gateway, which announces the chosen prefix, stops announcing prefixes**
 - ▶ **e.g. after shutting down the interface connecting it to the external network;**
 - 5. After a movement of one or more MANET devices, a gateway has a better metric than the gateway announcing the chosen prefix;**
- ▶ **Threshold algorithm accounts for dynamic scenarios**

Global Addresses Advertising

- ▶ **GA Advertising minimizes outages after address change**
 - ▶ **Since nodes has already disseminated their “new” global address (after they first received prefixes from other gateways), they can start using it as SA with negligible latency.**

- ▶ **If Mobile IPv6 is used**
 - ▶ **A MN send a BU when its global address changes**
 - ▶ **the gateway already has a valid route towards the new global GA**
 - ▶ **BA is immediately delivered, no route discovery needed**

Pros and Cons

- ✓ Node can always use best path for “downlink traffic” and effectively exploit all available gateways
- ✓ Merging and partitioning cause no major problems
- ✓ Account for situations where gateways intermittently appear and disappear

- ✗ Optimized for proactive protocols
- ✗ Overhead of global address advertising (actually, optional)

Draft status

- ▶ **Currently, version -03**

- ▶ **Future work**
 - ▶ **Interaction between Best Prefix Selection and IPv6 SA selection must be further studied**
 - ▶ **Overhead introduced by GA Advertising should be further analyzed**
 - ▶ **Detailed operations for OLSRv2**
 - ▶ **Investigation on interactions with DYMO**

- ▶ **Linux implementation (based on OLSRv1) and ns-2 code**
 - ▶ **Demo at Mobicom 2005**

- ▶ **For updated versions**
 - ▶ **<http://vesuvio.ipv6.cselt.it/ruffino/>**