Network Working Group J.-H. Lee
Internet-Draft M. Tsukada
Intended status: Informational T. Ernst
Expires: April 22, 2010 INRIA Rocquencourt
October 19, 2009

Mobile Network Prefix Provisioning
draft-jhlee-mext-mnpp-00.txt

Status of this Memo

Copyright Notice

Abstract

In the context of vehicular networks for Intelligent Transportation Systems (ITS), vehicles that comprise in-vehicle networks require to discover Mobile Network Prefixes (MNPs) of other vehicles in order to communicate with other vehicles or the roadside infrastructure on the same wireless link. This document proposes Mobile Network Prefix Provisioning (MNPP), a solution to advertise an MNP assigned to a vehicle to others in both a proactive or reactive fashion.

Table of Contents

1. Introduction

In vehicular networks for ITS, vehicles require to communicate with other vehicles or the roadside infrastructure on the same wireless link. Vehicles comprise their in-vehicle networks where permanent IPv6 prefixes are allocated. The permanet IPv6 prefix is here referred as an MNP as defined in [RFC3753], [RFC3963]. The MNP being used in the in-vehicle network of the vehicle is provided by a Home Agent operating in a remote central ITS network. The in-vehicle network is attached to a public or private network through its Vehicular Mobile Router (VMR) operating as NEMO Basic Support [RFC3963] for maintaining IP session continuity while performing vertical and horizontal handovers. As such, VMRs attached to the in-vehicle network of the VMR have permanent Home Addresses (HoAs) configured from the MNP.

While VMRs remain in a reachable wireless communication range of a Roadside Access Router (RAR), the VMRs would configure a link-local address and a global Care-of Address (CoA). However, vehicles need to discover IPv6 prefixes, i.e., MNPs, associated with neighbor vehicles in order for Mobile Network Nodes (MNNs) to talk to one another.

Without any specific mechanisms, VMRs would only know what is the link-local address or CoA of neighbor vehicles, but not their associated MNPs. This document proposes Mobile Network Prefix Provisioning (MNPP), a solution based on an extension of Neighbor Discovery Protocol (NDP) [RFC4861] to distribute the MNP in both a proactive or reactive fashion.

2. 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].

The document uses the terminology specified in [RFC3753], [RFC3963]. In addition, this document defines the following:

- Vehicular Mobile Router (VMR): A mobile router located at the vehicle that provides communication service to devices connected to its in-vehicle network.

- Roadside Access Router (RAR): An access router located at the roadside infrastructure that provides communication service to vehicles.

- Mobile Network Prefix Provisioning (MNPP) Solicitation Message: A solicitation message sent by the VMR or the RAR to receive an advertisement message containing the MNP information quickly.

- Mobile Network Prefix Provisioning (MNPP) Advertisement Message: An advertisement message sent by the VMR to announce its MNP information. This message is periodically sent, or in response to a solicitation message.

3. Mobile Network Prefix Provisioning

The proposed mechanism in this document extends the router advertisement (RA) and router solicitation (RS) messages defined in NDP to announce the MNP assigned to a vehicle to other vehicles or the roadside infrastructure on the same wireless link.

In order to distribute the MNP, MNPP Advertisement messages are sent through the egress interface of VMR which is used to communicate with other vehicles or the roadside infrastructure. Note that the ingress interface of the VMR is connected with its in-vehicle network. MNPP Solicitation messages are used to request MNPP Advertisement messages quickly.

- As a proactive fashion, the VMR periodically sends the unsolicited MNPP Advertisement messages including the MNP being used in its in-vehicle network. Upon reception of the MNPP Advertisement message, other VMRs and RARs obtain the MNP of the VMR. It is similar to the case of sending unsolicited RA messages defined in NDP.

- As a reactive fashion, the VMR upon reception of the MNPP Solicitation messages immediately sends the solicited MNPP Advertisement messages including the MNP being used in its in-vehicle network. The MNPP Solicitation messages SHOULD be used to prompt VMRs to generate the MNPP Advertisement messages quickly. It is similar to the case of requesting solicited RA messages defined in NDP.

4. Applicable Scenarios

TBA.

4.1. Infrastructure-based scenario

TBA.

4.2. Infrastructure-less scenario

TBA.

5. Message Formats

This section provides message formats for MNPP Solicitation and MNPP Advertisement messages used in this document.

5.1. Mobile Network Prefix Provisioning Solicitation

VMRs and RARs send MNPP Solicitation messages in order to prompt VMRs to generate MNPP Advertisement messages quickly.

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |     Type      |     Code      |          Checksum             |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                            Reserved                           |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |   Options ...
   +-+-+-+-+-+-+-+-+-+-+-+-+-
```

IP Fields:

Source Address

An IPv6 address assigned to the sending interface.

Destination Address

The all-routers multicast address or the specific IPv6 address.

Hop Limit

255

ICMP Fields:

Type

TBA. The ICMP type number MUST be allocated by the IANA.

Code

0

Checksum

The ICMP checksum. See [RFC4443].

Reserved

This field is unused. It MUST be initialized to zero by the sender and MUST be ignored by the receiver.

Valid Options:

Source link-layer address

The link-layer address of the sender SHOULD be included.

Receivers MUST sliently igonore any options if they do not recognize and continue processing.

5.2. Mobile Network Prefix Provisioning Advertisement

VMRs send out MNPP Advertisement messages periodically (as a proactive fashion), or in response to MNPP Solicitation messages (as a reactive fashion).

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |     Type      |     Code      |          Checksum             |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                            Reserved                           |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |   Options ...
   +-+-+-+-+-+-+-+-+-+-+-+-
```

IP Fields:

Source Address

An IPv6 address assigned to the sending interface.

Destination Address

The all-routers multicast address or the specific IPv6 address.

Hop Limit

255

ICMP Fields:

Type

TBA. The ICMP type number MUST be allocated by the IANA.

Code

0

Checksum

The ICMP checksum. See [RFC4443].

Reserved

This field is unused. It MUST be initialized to zero by the sender and MUST be ignored by the receiver.

Valid Options:

Source link-layer address

The link-layer address of the sender SHOULD be included.

In-vehicle MTU

The MTU used in the in-vehicle network SHOULD be sent.

Mobile Network Prefix Option

The MNP MUST be included to indicate which prefix is being used in the in-vehicle network.

Receivers MUST slientiy igonore any options if they do not recognize and continue processing.

6. Security Considerations

TBA.

7. IANA Considerations

The ICMP type numbers for MNPP Solicitation and Advertisement messages MUST be allocated by the IANA.

8. Next Text

The following issues will be covered in the next version of this document.

- Applicable Scenarios: MNPP operates in both infrastructure-based and infrastructure-less scenarios. In the next version of this document, applicable scenarios will be covered.

- Security Considerations: A number of threats addressed in [RFC3756] are expected to launch on MNPP used to announce the MNP of a VMR. Secure Neighbor Discovery (SEND) [RFC3971] SHOULD be extended to protect the transaction of MNPP Solicitation and Advertisement messages. In the next version of this document, security considerations will be covered.

9. Acknowledgment

Comments are solicited and should be addressed to the MEXT working group's mailing list at mext@ietf.org and/or the authors.

10. References

[RFC3753] Manner, J. and M. Kojo, "Mobility Related Terminology", RFC 3753, June 2004.

[RFC3963] Devarapalli, V., Wakikawa, R., Petrescu, A., and P. Thubert, "Network Mobility (NEMO) Basic Support Protocol", RFC 3963, January 2005.

[RFC4861] Narten, T., Nordmark, E., Simpson, W., and H. Soliman, "Neighbor Discovery for IP version 6 (IPv6)", RFC 4861, September 2007.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate

Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4443] Conta, A., Deering, S., and M. Gupta, "Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification", RFC 4443, March 2006.

[RFC3756] Nikander, P., Kempf, J., and E. Nordmark, "IPv6 Neighbor Discovery (ND) Trust Models and Threats", RFC 3756, May 2004.

[RFC3971] Arkko, J., Kempf, J., Zill, B., and P. Nikander, "SEcure Neighbor Discovery (SEND)", RFC 3971, March 2005.

Authors' Addresses

Jong-Hyouk Lee
INRIA Rocquencourt
Domaine de Voluceau B.P. 105
Le Chesnay, 78153
France

Phone: +33 1 39 63 59 30
Email: jong-hyouk.lee@inria.fr; jonghyouk@gmail.com

Manabu Tsukada
INRIA Rocquencourt
Domaine de Voluceau B.P. 105
Le Chesnay, 78153
France

Phone: +33 1 39 63 59 30
Email: manabu.tsukada@inria.fr

Thierry Ernst
INRIA Rocquencourt
Domaine de Voluceau B.P. 105
Le Chesnay, 78153
France

Phone: +33 1 39 63 59 30
Email: thierry.ernst@inria.fr