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Use Cases and API Extension for Source IP Address Selection
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Abstract

This draft specifies and analyzes the expected cases regarding the selection of a proper source IP address and address type based on the application features over a distributed mobility management (DMM) network. It also provides available selection methods to better achieve DMM goals in the specified scenarios.

Table of Contents

1. Introduction

In [I-D.ietf-dmm-ondemand-mobility], it suggests picking up a proper source IP address type for an initiated application in a mobile node (MN), taking into consideration the need for IP session continuity and/or IP address reachability by the application. Therefore, source IP addresses were defined in three types with regard to providing the required mobility management capabilities: fixed IP address, session-lasting IP address, and non-persistent IP address. Following the classified IP address type defined in the on-demand mobility draft [I-D.ietf-dmm-ondemand-mobility] , the MN obtains a proper IP address corresponding to a specific address type requirement when an application tries to get an IP address, whereas the former approaches

[RFC5014][RFC6724] operate on the available set of IP addresses, based on a preference. But even within a request for a specific type of IP address request, there may be a need to indicate further requirements such as which IP address is preferred among the available IP addresses belonging to the same type requested by the application. Such a situation may easily be met over a DMM network environment for some reasons such as QoS or Policy, as an MN is supposed to obtain new IP prefixes from the different serving networks to which it attaches. To check and reflect further requirements based on the IP address types defined in the on-demand mobility management, this draft categorizes and describes expected use cases where an MN is likely to be encountered and proposes required extensions to fill the gaps found from the use cases study.

2. Use Cases

We categorize and analyze expected use cases where the MN tries to initiate an application.

2.1. When an application does not have specific IP address type requirement and address preferences

Applications such as a text-based web browsing or information-centric service, e.g. weather and stock information, as well as legacy applications may belong to this category. As many applications require short-lived Internet connection without session continuity and IP address reachability, assigning a non-persistent IP address can be considered a default for MNs. But it is subject to address assignment policy by network operators. The suggested flag, IPV6_REQUIRE_NON-PERSISTENT_IP, defined in [I-D.ietf-dmm-ondemand-mobility] is used for expressing its preference to the IP stack.

2.2. When an application has specific IP address type requirement and address preference

This category is for an application requiring IP session continuity with different granularity of IP address reachability. This case may be further divided in three sub-cases with regard to IP address type availability and/or address selection.

2.2.1. Case 1: there is no configured IP address based on a requested type in the IP stack

For mobility support in terms of IP session continuity and IP address reachability, session-lasting IP address and fixed IP address are used. When one IP address based on one of the two types using flags (IPV6_REQUIRE_FIXED_IP or IPV6_REQUIRE_SESSION_LASTING_IP) is

requested, a proper address assignment procedure based on DHCP or IP mobility management protocol is expected.

2.2.2. Case 2: there are one or more configured IP addresses based on a requested type in the IP stack, and no selection preference by the application

In this case, the situation the MN meets is the same as Case 1 described above, except the existence of configured IP addresses belonging to the requested IP address type in the IP stack, e.g. due to different address assignment policy by an operator. Expected operation can be described as follows:

1. The MN is configured with one or more session-lasting IP addresses.

2. Once an application requests "session-lasting IP address" to the IP stack, it will use the existing session-lasting IP address when there is one session-lasting IP address available in the IP stack. If there are multiple available session-lasting IP addresses, the default address selection rules will be applied [RFC6724], e.g. with scope preference, longest prefix matching, and/or so on. The best-matched IP address among them will be selected and assigned to the application.

3. The MN moves to another serving network, while the previous (mobile) sessions are still working. A new application requests a session-lasting IP address with the address flag to the IP stack. The selection of the session-lasting IP address follows the same procedure as described in Step 2.

2.2.3. Case 3: there are one or more configured IP addresses based on a requested type in the IP stack, but there is a further selection preference by the application

In case of session-lasting IP address, the procedure to assign and configure session-lasting IP addresses is the same as the procedure described in Case 2 when following the three types of IP addresses in [I-D.ietf-dmm-ondemand-mobility].

Suppose that there one or more session-lasting IP address type-based applications are running. In the situation, a newly initiated application may get one of the session-lasting IP addresses being used, not requesting a new session-lasting IP address to the network. Some applications using the existing session-lasting IP address may get affected by the established routing path while other applications may get affected much. In [I-D.ietf-dmm-ondemand-mobility], the on-demand mobility is meant to enable applications to have the desired

mobility capability, i.e. IP address session continuity and/or IP address reachability, by proper selection of source IP addresses. On the other hand, it needs to be extended to have dynamic mobility management capability, which should be considered when session-lasting IP address is used. The specified operation based on the definition of address flags in [I-D.ietf-dmm-ondemand-mobility] does not ensure the observation of the dynamic mobility principle, where IP mobility is provided only upon an MN's movement. This is because an initiated application may be served with IP mobility even though the MN has not moved from the current serving network where the IP prefix/address was assigned for the Application. As a result, IP mobility may be activated before needed, so the new session is served by a remote IP mobility anchor with necessary mobility management functions, though the MN has not moved yet.

To make a proper way of delivering further preference of an application, additional definition for address selection preference in address flag level will help fill the requirement. See Section 3 for the proposed flag.

2.3. Gaps in the consistency with the default address selection

The need of an indication mechanism can be sought in the consistency with the former IETF standards. For example, in [RFC6724] where default behavior for IPv6 is specified, without a proper indication mechanism, following conflicts are expected to happen. In Rule 6 in [RFC6724], it is said that the matching label between source address of an IPv6 host and destination address is preferred among combinations between other source addresses and destination address, where the label is a numeric value representing policies that prefer a particular source address prefix for use with a destination address prefix in [RFC6724]. In Rule 8 in [RFC6724], it is said that the longest matching prefix between source address of an IPv6 host and destination address is preferred among combinations between other source addresses and destination address. Following Rules 6 and 8, selection of a prefix may be different from the application's preference that it wants to get connected, e.g. in terms of optimal routing over the described distributed environments.

3. Indications for expressing address preference requirement

When an application prefers a new IP address of the requested IP address type, additional indication flags should be delivered through the socket API interface.

3.1. When an application does not have specific IP address type requirement and address preferences

To support dynamic mobility of an initiated application using session-lasting IP address, a new address preference flag needs to be defined. Definition of additional flag should be simple and useful while going along with the three types of IP addresses. But careful consideration may be needed in defining the level of address preference flag among "requirement" or "preference". The objective of the hereby presented address preference flag is letting the IP stack check whether it has an available IP address assigned from the current serving network when the flag is received by an initiated application. If not, it will trigger the IP stack to get a new IP address from the current serving network. We call it "ON_NET" property.

If it is defined in the requirement level, the IP address confirmed to the address preference requirement should be used, though other session-lasting IP addresses, not assigned from the current serving network, are available. If there are multiple session-lasting IP addresses matched with ON_NET property, the default source address selection rules will be applied.

If it is defined in the preference level, priority value for ON_NET flag should be determined among the other address preference flags defined in [RFC5014].

IPV6_XX_SRC_ON_NET

/* Require (or Prefer) an IP address based on a requested IP address type as source, assigned from the current serving network, whatever it has been assigned or should be assigned */

This flag aims to express the preference to check an IP address, being used by an application, previously assigned from the current serving network and to use it or to get an IP address from the current serving network, as well as enabling differentiated per-flow anchoring where an obtained session-lasting IP address might be used for all initiated session-lasting IP applications. The use of the flag can be combined together with the three types of IP address defined in [I-D.ietf-dmm-ondemand-mobility].

In [I-D.mccann-dmm-prefixcost], it proposes that the Router Advertisement signaling messages communicate the cost of maintaining a given prefix at the MN's current point of attachment. The objective is to make a dynamic and optimal decision of address assignment and release, i.e. when to release old addresses and assign new ones. The proposed ON_NET property may present a way to deliver

a prefix decision for an application, specifically from a routing distance point of view, to the IP stack.

4. IANA Considerations

This document makes no request of IANA.

5. Security Considerations

T.B.D.

6. Acknowledgements

7. References

7.1. Normative References

[RFC6724] Thaler, D., Ed., Draves, R., Matsumoto, A., and T. Chown, "Default Address Selection for Internet Protocol Version 6 (IPv6)", RFC 6724, DOI 10.17487/RFC6724, September 2012, <http://www.rfc-editor.org/info/rfc6724>.

7.2. Informative References

[I-D.ietf-dmm-ondemand-mobility] Yegin, A., Moses, D., Kweon, K., Lee, J., and J. Park, "On Demand Mobility Management", draft-ietf-dmm-ondemand-mobility-07 (work in progress), July 2016.

[I-D.mccann-dmm-prefixcost] McCann, P. and J. Kaippallimalil, "Communicating Prefix Cost to Mobile Nodes", draft-mccann-dmm-prefixcost-03 (work in progress), April 2016.

[RFC5014] Nordmark, E., Chakrabarti, S., and J. Laganier, "IPv6 Socket API for Source Address Selection", RFC 5014, DOI 10.17487/RFC5014, September 2007, <http://www.rfc-editor.org/info/rfc5014>.

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