

NETEXT WG
Internet-Draft
Intended status: Standards Track
Expires: January 6, 2012

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July 5, 2011

IP Traffic Offload Selector Option for Proxy Mobile IPv6
draft-gundavelli-netext-pmipv6-sipto-option-01.txt

Abstract

This specification defines a mechanism and a related mobility option for carrying IP Offload traffic selectors between a mobile access gateway and a local mobility anchor in a Proxy Mobile IPv6 domain. Based on the received offload flow selectors from the local mobility anchor, a mobile access gateway can enable offload traffic rule on the selected IP flows.

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1. Introduction

Mobile Operators are expanding their network coverage by integrating various access technology domains into a common IP mobile core. For providing IP mobility support to a mobile node irrespective of the access network to which it is attached, the 3GPP S2/a Proxy Mobile IPv6 [TS23402] interface, specified by the 3GPP system architecture, is providing the needed protocol glue. When this protocol interface based on Proxy Mobile IPv6 [RFC5213] is used, the mobile node is topologically anchored on the local mobility anchor [RFC5213] in the home network. The mobile node's IP traffic is always tunneled back from the mobile access gateway [RFC5213] in the access network to the local mobility anchor in the home network.

However, with the exponential growth in the mobile data traffic, mobile operators are exploring new ways to offload some of the IP traffic flows at the nearest access edge where ever there is an internet peering point, as supposed to carrying it all the way to the mobility anchor in the home network. Not all IP traffic needs to be routed back to the home network, some of the non-essential traffic which does not require IP mobility support can be offloaded at the mobile access gateway in the access network. This approach provides greater leverage and efficient usage of the mobile packet core with increased overall network capacity and by lowering transport costs. The local mobility anchor in the home network can potentially deliver the IP flow selectors to the mobile access gateway in the access network, for identifying the IP flows that needs to be offloaded.

This document defines a new mobility option, IP Traffic Offload Selector option for Proxy Mobile IPv6 (PMIPv6). This option can be used by the local mobility anchor for notifying the flow selectors for that can be used by the local mobility anchor for notifying the mobile access gateway flows that can be offloaded at the access edge. Since, the mobile node's IP address topologically belongs to the home network, the offloaded IP traffic flows need to be NAT [RFC2663] translated. Given this NAT translation requirement for the offloaded traffic, this approach will be limited to mobile node's IPv4 flows. There are better ways to solve this problem for IPv6 and with the goal not to create NAT66 requirement, this specification does not support traffic offload support for IPv6 flows. This document also does not define any new semantics for flow selectors. The flow identification and the related semantics are all leveraged from [RFC6088].

2. Conventions and Terminology

2.1. Conventions

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 RFC 2119 [RFC2119].

2.2. Terminology

All the mobility related terms used in this document are to be interpreted as defined in the base Proxy Mobile IPv6 specifications [RFC5213] and [RFC5844]. Additionally, this document uses the following abbreviations:

IP Flow

IP Flow represents a set of IP packets that match a traffic selector. The selector is typically based on the source IP address, destination IP address, source port, destination port and other fields in upper layer headers.

Selective IP Traffic Offload (SIPTO)

Ability to select specific IP flows and route them to the local network, as supposed to tunneling them to the home network.

NAT (Network Address Translation)

Network Address Translation [RFC2663] is a method by which IP addresses are mapped from one address realm to another, providing transparent routing to end hosts.

3. Solution Overview

The following illustrates the scenario where the mobile access gateway in an access network having the ability to offload some of the IPv4 traffic flows, based on the traffic selectors it received from the local mobility anchor in the home network.

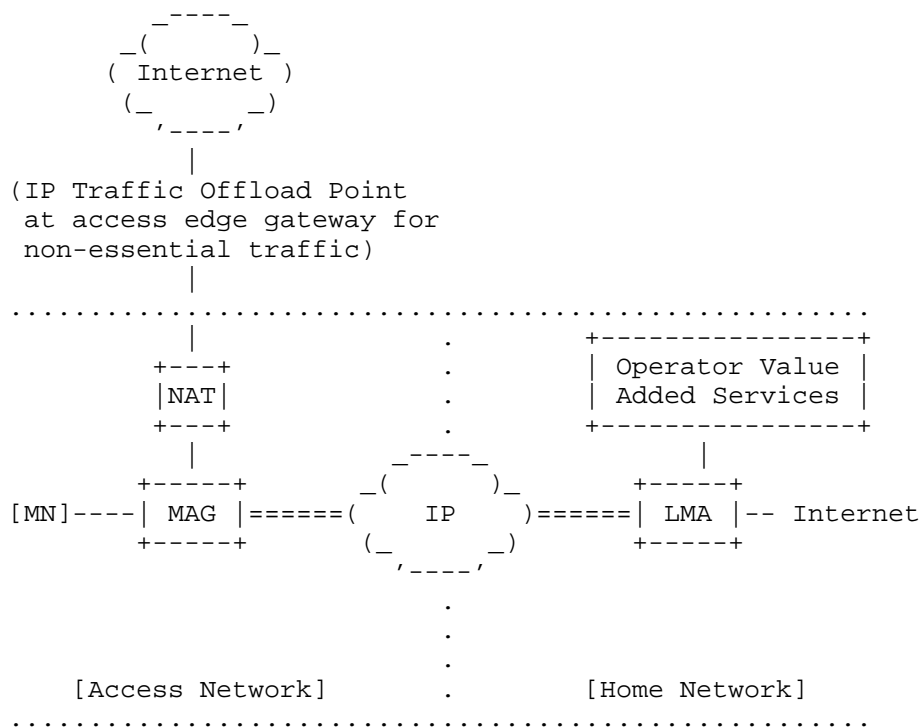


Figure 1: Access Networks attached to MAG

3.1. LMA Considerations

The following considerations apply to the local mobility anchor and the mobile access gateway.

Figure 1 explains the operational sequence of the IP Traffic Offload selectors between the mobile access gateway and the local mobility anchor.

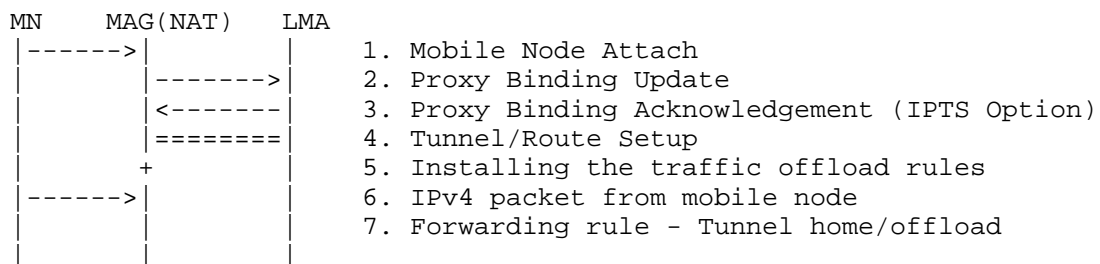


Figure 2: Exchange of IP Traffic Offload Selectors

- o If the received Proxy Binding Update includes the IP Traffic Offload Selector Option Section 4, but if the local mobility anchor either does not have the SIPTO capability, or it chooses to deny the SIPTO request, the local mobility anchor MUST ignore the IP Traffic Offload Selector Option and this would have no effect on the operation of the rest of the protocol.
- o If the local mobility anchor has the SIPTO capability and chooses to deliver the flow policies, the local mobility anchor can construct the traffic selectors based on the routing policy and deliver those selectors in the Proxy Binding Acknowledgement message using the IP Traffic Offload Selector Option. If the received Proxy Binding Update included a proposed Offload traffic selectors, the local mobility anchor MAY choose to honor that request.

3.2. MAG Considerations

- o The mobile access gateway MAY choose to notify the local mobility anchor about its SIPTO capability by including the IP Traffic Offload Selector Option Section 4 in the Proxy Binding Update message. The included option MAY include the proposed offload selectors which the local mobility anchor may choose to override. If the mobile access gateway cannot does not have SIPTO capability, this option MUST NOT be included in the Proxy Binding Update.
- o If there is no IP Traffic Offload Selector Option in the corresponding Proxy Binding Acknowledgement message, it is considered that the local mobility anchor does not support SIPTO capability, specifically, it cannot deliver selectors for IP traffic offload flows.
- o If there IP Traffic Offload Selector Option in the corresponding Proxy Binding Acknowledgement message, it serves as an hint that the local mobility anchor can support SIPTO and the included traffic spec MUST be applied by the mobile access gateway.

4. IP Traffic Offload Selector Option

A new option, IP Traffic Offload Selector option, is defined for using it in Proxy Binding Update (PBU) and Proxy Binding Acknowledgement (PBA) messages exchanged between a local mobility anchor and a mobile access gateway. This option is used for carrying the flow selectors for supporting IP traffic offload function at the

mobile access gateway. The option includes the parameters for selecting IP flows for offload.

The alignment requirement for this option is 4n.

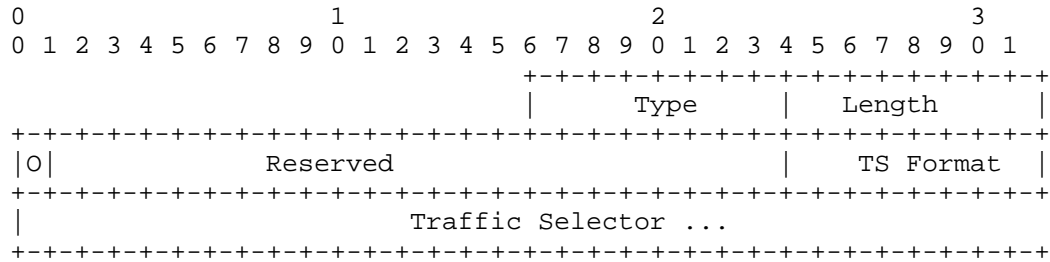


Figure 3: IP Traffic Offload Selector Option

Type

<IANA>

Length

8-bit unsigned integer indicating the length in octets of the option, excluding the type and length fields.

Reserved This field is unused for now. The value MUST be initialized to 0 by the sender and MUST be ignored by the receiver.

TS Format An 8-bit unsigned integer indicating the Traffic Selector Format. Value "0" is reserved and MUST NOT be used. The value of (1) is assigned for IPv4 Binary Traffic Selector [RFC6088].

TS Selector A variable-length opaque field for including the traffic specification identified by the TS format field. When the value of TS Format field is set to (1), the format that follows is the IPv4 Binary Traffic Selector specified in section 3.1 of [RFC6088].

5. IANA Considerations

This document requires the following two IANA actions.

- o Action-1: This specification defines a new Mobility Header option, IP Traffic Offload Selector option. This option is described in Section 4. The Type value for this option needs to be assigned

from the same numbering space as allocated for the other mobility options [RFC3775].

- o Action-2: The Sub-type field of the IP Traffic Offload Selector option introduces a new number space. This number space needs to be managed by IANA, under the Registry, IP Traffic Offload Selector Type Registry. This specification reserves the sub-type value of (1) and (2). Approval of new sub-type values are to be made through IANA Expert Review.

6. Security Considerations

The IP Traffic Offload Selector option defined in this specification is for use in Proxy Binding Update and Proxy Binding Acknowledgement messages. This option is carried like any other mobility header option as specified in [RFC5213] and does not require any special security considerations. Carrying IP traffic offload selectors does not introduce any new security vulnerabilities.

7. Acknowledgements

The authors would like to thank Rajesh Pazhyannur, Kent Leung, Mark Grayson, Frank Brockners, Woj Dec, and Steve Wood for all the discussions related to the topic of IP traffic offload. The authors would like to acknowledge the work related SIPTO in 3GPP SA2 working group.

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