Carrying an Identifier in IPv6 packets

Abstract

Some recent use cases have a need for carrying an identifier in IPv6
packets. While those drafts might perfectly make sense on their own,
each document requires IANA to allocate a new code point for a new
option, and so for very similar situations, which could quickly
exhaust the allocation space if similar designs are proposed in the
future. As an example, one might need an 8-bit ID, while another one
might need a 32-bit, 64-bit or 128-bit ID. Or, even worse, one might
need a 32-bit ID in a specific context, while someone else might
also need a 32-bit ID in another context. Therefore, allocating a
new code point for each similar option is probably not the way to
go.

About This Document

This note is to be removed before publishing as an RFC.

The latest revision of this draft can be found at https://
IurmanJ.github.io/draft-iurman-6man-carry-identifier/draft-
iurman-6man-carry-identifier.html. Status information for this
document may be found at https://datatracker.ietf.org/doc/draft-
iurman-6man-carry-identifier/.

Discussion of this document takes place on the IPv6 Maintenance
Working Group mailing list (mailto:ipv6@ietf.org), which is archived
at https://mailarchive.ietf.org/arch/browse/ipv6/. Subscribe at
https://www.ietf.org/mailman/listinfo/ipv6/.

Source for this draft and an issue tracker can be found at https://
github.com/IurmanJ/draft-iurman-6man-carry-identifier.

Status of This Memo

working documents as Internet-Drafts. The list of current Internet-Drafts is at https://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 12 August 2023.

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Table of Contents

1. **Introduction**

Some recent use cases have a need for carrying an identifier in IPv6 packets. Two examples are [I-D.draft-ietf-6man-enhanced-vpn-vtn-id] and [I-D.draft-li-6man-topology-id]. While those drafts might perfectly make sense on their own, each document requires IANA to

allocate a new code point for a new option, and so for very similar situations, which could quickly exhaust the allocation space if similar designs are proposed in the future. As an example, one might need an 8-bit ID, while another one might need a 32-bit, 64-bit or 128-bit ID. Or, even worse, one might need a 32-bit ID in a specific context, while someone else might also need a 32-bit ID in another context. Therefore, allocating a new code point for each similar option is probably not the way to go.

This document proposes two different solutions to carry an identifier in IPv6 packets, in order to avoid the aforementioned issue. Each solution defines a new option in the Destination Options and Hop-by-Hop Options sub-registry. Both are explained in this document.

2. Conventions and Definitions

The key words **"MUST"**, **"MUST NOT"**, **"REQUIRED"**, **"SHALL"**, **"SHALL NOT"**, **"SHOULD"**, **"SHOULD NOT"**, **"RECOMMENDED"**, **"NOT RECOMMENDED"**, **"MAY"**, and **"OPTIONAL"** in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Solution 1: Generic Identifier

For simple use cases such as a single identifier carried without additional fields and without specific context, a new Option Type named "Generic Identifier" is defined as follows:

```
                        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
                       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                       |  Option Type  |  Opt Data Len |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                                                               |
 ~                   Identifier (variable length)               ~
 |                                                               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
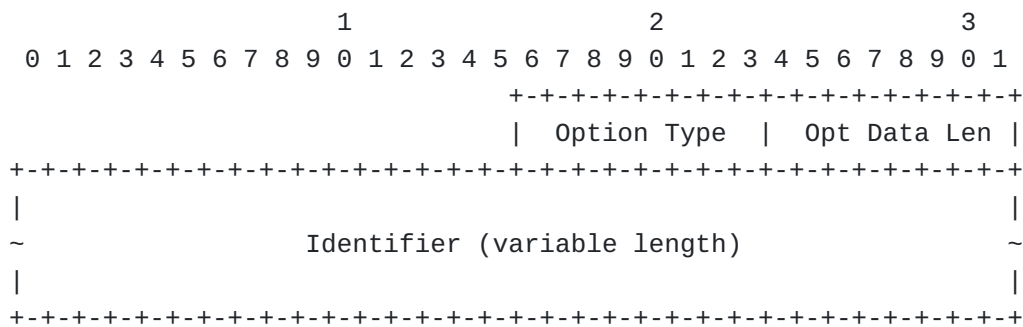
Figure 1. Generic Identifier Option

where:

  *Option Type: 8-bit option type as defined in Section 5.1.

  *Opt Data Len: 8-bit unsigned integer. Length of the Identifier field, in octets.

  *Identifier: variable length field representing the carried identifier.

3.1. Pros and Cons

(+) Totally generic solution, similar to an Identifier container.

(-) Too generic, as it could be used to carry all and nothing.
(-) No context for the carried identifier, which might disturb the receiver.
(-) No multiple identifiers, where some use cases might need to carry more than one.
(-) No additional fields, where some use cases might need that.

4. Solution 2: Identifier with Context

For use cases where one or several identifiers are carried with additional fields, or when a context is required, a new Option Type named "Identifier with Context" is defined as follows:
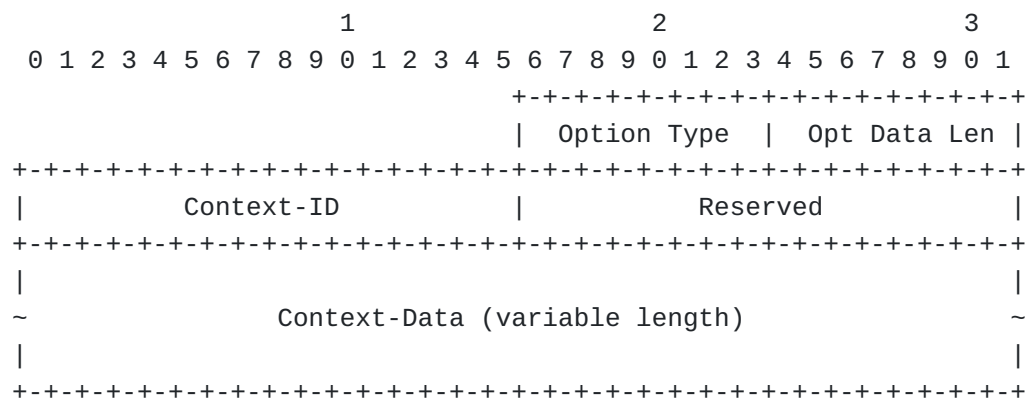
```
                        1                   2                   3
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
                       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                       | Option Type   | Opt Data Len |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |            Context-ID          |             Reserved          |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                                                               |
  ~              Context-Data (variable length)                  ~
  |                                                               |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 2. Identifier with Context Option

where:

  *Option Type: 8-bit option type as defined in Section 5.2.

  *Opt Data Len: 8-bit unsigned integer. Length of this option, in octets, not including the first 2 octets.

  *Context-ID: 16-bit field as defined in Section 5.2.1.

  *Reserved: 16-bit field **MUST** be set to zero upon transmission and ignored upon reception.

  *Context-Data: variable length field representing a data structure which depends on the Context-ID field.

4.1. Pros and Cons

(+) Allows for a context.
(+) Allows for multiple identifiers.

(+) Allows for additional fields.
    (+) IETF review process for new Context-ID code points.

    (-) Not hardware friendly.

5. IANA Considerations

5.1. Generic Identifier (Solution 1)

   If the solution is adopted, this document requests IANA to allocate
   the following IPv6 Option Type in the Destination Options and Hop-
   by-Hop Options sub-registry of Internet Protocol Version 6 (IPv6)
   Parameters:

   | Binary Value | | | Description | Reference |
act	chg	rest		
00	0	TBD	Generic Identifier Option	[This document]

5.2. Identifier with Context (Solution 2)

   If the solution is adopted, this document requests IANA to allocate
   the following IPv6 Option Type in the Destination Options and Hop-
   by-Hop Options sub-registry of Internet Protocol Version 6 (IPv6)
   Parameters:

   | Binary Value | | | Description | Reference |
act	chg	rest		
00	0	TBD	Identifier with Context Option	[This document]

   This document also requests IANA to define a registry group named
   "Identifier with Context". The following subsections detail the
   registries therein contained.

5.2.1. Context-ID

   This registry defines 65536 code points for the Context-ID field, in
   order to know the context. The following code points are defined in
   this document:

```
Code point        Description              Reference
+--------+-------------------------+----------------+
| 0x0000 |         Reserved        | This document  |
+--------+-------------------------+----------------+
| 0x0001 |                         |                |
|  ....  |         Unassigned      |                |
| 0xffef |                         |                |
+--------+-------------------------+----------------+
| 0xfff0 |                         |                |
|  ....  | RFC3692-style Experiment |    [RFC8126]   |
| 0xfffe |                         |                |
+--------+-------------------------+----------------+
| 0xffff |         Reserved        | This document  |
+--------+-------------------------+----------------+
```

Unassigned code points are available for assignment via the "IETF
Review" process, as per [RFC8126]. For a new registration request to
be accepted, its main purpose **MUST** be to carry an identifier. The
aforementioned identifier **MUST** be the centerpiece of the new
context.

New registration requests **MUST** use the following template:

  *Code point: requested code point for the new Context-ID.

  *Description: name of the new Context-ID.

  *Reference: reference to the document that defines the new
   Context-ID.

6. Security Considerations

As this document describes new options for IPv6, these are similar
to the security considerations of [RFC8200] and the weakness
documented in [RFC8250].

This document does not define security considerations for the
Context-Data field of the Identifier with Context Option, which
varies based on the Context-ID. These custom data structures will
have security considerations in their own documents that define the
new formats.

7. References

7.1. Normative References

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7.2. Informative References

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Acknowledgments

Author's Address

Justin Iurman
ULiege
Institut Montefiore B28
Allée de la Découverte 10
4000 Liège
Belgium

Email: justin.iurman@uliege.be