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Recommendation on Stable IPv6 Interface Identifiers draft-ietf-6man-default-iids-13

Abstract

This document changes the recommended default IID generation scheme for cases where SLAAC is used to generate a stable IPv6 address. It recommends using the mechanism specified in [RFC7217](#) in such cases, and recommends against embedding stable link-layer addresses in IPv6 Interface Identifiers. It formally updates [RFC2464](#), [RFC2467](#), [RFC2470](#), [RFC2491](#), [RFC2492](#), [RFC2497](#), [RFC2590](#), [RFC3146](#), [RFC3572](#), [RFC4291](#), [RFC4338](#), [RFC4391](#), [RFC5072](#), and [RFC5121](#), by removing the text in these RFCs that required the IPv6 Interface Identifiers to be derived from the underlying stable link-layer address, and replacing this text with recommendations consistent with those in this document. Additionally, this document updates [RFC3315](#) by specifying additional requirements on the generation of Interface Identifiers used in Dynamic Host Configuration Protocol version 6 (DHCPv6). It also provides advice to system administrators who employ manual configuration. This document does not change any existing recommendations concerning the use of temporary addresses as specified in [RFC 4941](#).

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[1.](#) Introduction

[RFC4862] specifies Stateless Address Autoconfiguration (SLAAC) for IPv6 [[RFC2460](#)], which typically results in hosts configuring one or more "stable" addresses composed of a network prefix advertised by a local router, and an Interface Identifier (IID) [[RFC4291](#)] that typically embeds a stable link-layer address (e.g., an IEEE LAN MAC address).

In some network technologies and adaptation layers, the use of an IID based on a link-layer address may offer some advantages. For example, the IP-over-IEEE802.15.4 standard in [[RFC6775](#)] allows for compression of IPv6 addresses when the IID is based on the underlying link-layer address.

The security and privacy implications of embedding a stable link-layer address in an IPv6 IID have been known for some time now, and are discussed in great detail in [\[RFC7721\]](#). They include:

- o Network activity correlation
- o Location tracking
- o Address scanning
- o Device-specific vulnerability exploitation

More generally, the reuse of identifiers that have their own semantics or properties across different contexts or scopes can be detrimental for security and privacy [\[I-D.gont-predictable-numeric-ids\]](#). In the case of traditional stable IPv6 IIDs, some of the security and privacy implications are dependent on the properties of the underlying link-layer addresses (e.g., whether the link-layer address is ephemeral or randomly generated), while other implications (e.g., reduction of the entropy of the IID) depend on the algorithm for generating the IID itself. In standardized recommendations for stable IPv6 IID generation meant to achieve particular security and privacy properties, it is therefore necessary to recommend against embedding stable link-layer addresses in IPv6 IIDs.

Furthermore, some popular IPv6 implementations have already deviated from the traditional stable IID generation scheme to mitigate the aforementioned security and privacy implications [\[Microsoft\]](#).

As a result of the aforementioned issues, this document changes the recommended default IID generation scheme for generating stable IPv6 addresses with SLAAC to that specified in [\[RFC7217\]](#), and recommends against embedding stable link-layer addresses in IPv6 Interface Identifiers, such that the aforementioned issues are mitigated. That is, this document simply replaces the default algorithm that is recommended to be employed when generating stable IPv6 IIDs.

NOTE: [\[RFC4291\]](#) defines the "Modified EUI-64 format" for IIDs.

[Appendix A of \[RFC4291\]](#) then describes how to transform an IEEE EUI-64 identifier, or an IEEE 802 48-bit MAC address from which an EUI-64 identifier is derived, into an IID in the Modified EUI-64 format.

In a variety of scenarios, addresses that remain stable for the lifetime of a host's connection to a single subnet, are viewed as desirable. For example, stable addresses may be viewed as beneficial for network management, event logging, enforcement of access control,

provision of quality of service, or for server or routing interfaces. Similarly, stable addresses (as opposed to temporary addresses [[RFC4941](#)]) allow for long-lived TCP connections, and are also usually desirable when performing server-like functions (i.e., receiving incoming connections).

The recommendations in this document apply only in cases where implementations otherwise would have configured a stable IPv6 IID containing a link layer address. For example, this document does not change any existing recommendations concerning the use of temporary addresses as specified in [[RFC4941](#)], nor do the recommendations apply to cases where SLAAC is employed to generate non-stable IPv6 addresses (e.g. by embedding a link-layer address that is periodically randomized), nor does it introduce any new requirements regarding when stable addresses are to be configured. Thus, the recommendations in this document simply improve the security and privacy properties of stable addresses.

Finally this document updates [[RFC3315](#)] by specifying additional requirements on the generation of Interface Identifiers used in Dynamic Host Configuration Protocol version 6 (DHCPv6), and also provides advice to system administrators who employ manual configuration.

2. Terminology

Stable address:

An address that does not vary over time within the same network (as defined in [[RFC7721](#)]).

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](#)].

3. Generation of IPv6 Interface Identifiers with SLAAC

Nodes SHOULD implement and employ [[RFC7217](#)] as the default scheme for generating stable IPv6 addresses with SLAAC. A link layer MAY also define a mechanism for stable IPv6 address generation that is more efficient and does not address the security and privacy considerations discussed in [Section 1](#). The choice of whether to enable the security- and privacy-preserving mechanism or not SHOULD be configurable in such a case.

By default, nodes SHOULD NOT employ IPv6 address generation schemes that embed a stable link-layer address in the IID. In particular, this document RECOMMENDS that nodes do not generate stable IIDs with the schemes specified in [[RFC2464](#)], [[RFC2467](#)], [[RFC2470](#)], [[RFC2491](#)],

[[RFC2492](#)], [[RFC2497](#)], [[RFC2590](#)], [[RFC3146](#)], [[RFC3572](#)], [[RFC4338](#)], [[RFC4391](#)], [[RFC5121](#)], and [[RFC5072](#)]. The specific updates to these documents to effectuate this recommendation are included in [Section 6](#).

4. Generation of IPv6 Interface Identifiers with DHCPv6

By default, DHCPv6 server implementations SHOULD NOT generate predictable IPv6 addresses (such as IPv6 addresses where the IIDs are consecutive small numbers).

[[I-D.gont-dhcpv6-stable-privacy-addresses](#)] specifies one possible algorithm that could be employed to comply with this requirement. Another possible algorithm would be to select a pseudo-random value chosen from a discrete uniform distribution, while avoiding the reserved IPv6 Interface Identifiers [[RFC5453](#)] [[IANA-RESERVED-IID](#)].

5. Generation of IPv6 Interface Identifiers with Manual Configuration

Network administrators should be aware of the security implications of predictable Interface Identifiers [[RFC7721](#)], and avoid the use of predictable addresses when the aforementioned issues are of concern.

6. Update to existing RFCs

The following subsections clarify how each of the RFCs affected by this document are updated.

Note to the RFC Editor:

In the following subsections, the legend "[RFCXXXX]" should be replaced with the RFC number assigned to this document, and this note to the RFC Editor should be removed before publication of this document as an RFC.

6.1. Update to [RFC2464](#)

The entire text of [Section 4 of \[RFC2464\]\(#\)](#) is replaced with the following text:

```
----- cut here ----- cut here -----  
The Interface Identifier [AARCH] for an Ethernet interface SHOULD  
be generated as specified in [RFC7217]. Embedding a stable  
link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].  
----- cut here ----- cut here -----
```

The following text from [Section 6 of \[RFC2464\]\(#\)](#):

----- cut here ----- cut here -----
Ethernet Address

The 48 bit Ethernet IEEE 802 address, in canonical bit order. This is the address the interface currently responds to, and may be different from the built-in address used to derive the Interface Identifier.

----- cut here ----- cut here -----

is formally replaced with:

----- cut here ----- cut here -----
Ethernet Address

The 48 bit Ethernet IEEE 802 address, in canonical bit order. This is the address the interface currently responds to.

----- cut here ----- cut here -----

6.2. Update to [RFC2467](#)

The entire text of [Section 5 of \[RFC2467\]](#) is replaced with the following text:

----- cut here ----- cut here -----
The Interface Identifier [AARCH] for an FDDI interface SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].
----- cut here ----- cut here -----

The following text from [Section 7 of \[RFC2467\]](#):

----- cut here ----- cut here -----
FDDI Address

The 48 bit FDDI IEEE 802 address, in canonical bit order. This is the address the interface currently responds to, and may be different from the built-in address used to derive the Interface Identifier.

----- cut here ----- cut here -----

is formally replaced with:

----- cut here ----- cut here -----
FDDI Address

The 48 bit FDDI IEEE 802 address, in canonical bit order. This is the address the interface currently responds to.

----- cut here ----- cut here -----

6.3. Update to [RFC2470](#)

The entire text of [Section 4 of \[RFC2470\]](#) is replaced with the following text:

```
----- cut here ----- cut here -----  
The Interface Identifier [AARCH] for a Token Ring interface SHOULD  
be generated as specified in \[RFC7217\]. Embedding a stable  
link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].  
----- cut here ----- cut here -----
```

The following text from [Section 6 of \[RFC2470\]](#):

```
----- cut here ----- cut here -----  
Token Ring Address: The 48 bit Token Ring IEEE 802  
address, in canonical bit order. This is the address the  
interface currently responds to, and may be different from  
the built-in address used to derive the Interface  
Identifier.  
----- cut here ----- cut here -----
```

is formally replaced with:

```
----- cut here ----- cut here -----  
Token Ring Address: The 48 bit Token Ring IEEE 802  
address, in canonical bit order. This is the address the  
interface currently responds to.  
----- cut here ----- cut here -----
```

6.4. Update to [RFC2491](#)

The entire text of [Section 5.1](#), [Section 5.1.1](#), and [Section 5.1.2 of \[RFC2491\]](#) is replaced with the following text:

----- cut here ----- cut here -----
5.1 Interface Tokens

The Interface Token (or Interface Identifier [AARCH]) for each IPv6 interface SHOULD be generated as specified in [RFC7217]. Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

All implementations MUST support manual configuration of interface tokens to allow operators to manually change a interface token on a per-LL basis. Operators may choose to manually set interface tokens for reasons other than eliminating duplicate addresses.

All interface tokens MUST be 64 bits in length.

----- cut here ----- cut here -----

6.5. Update to [RFC2492](#)

The entire text of [Section 5](#) (and all the corresponding subsections) of of [RFC2492] is replaced with the following text:

----- cut here ----- cut here -----
5.1 Interface Tokens

The Interface Token (or Interface Identifier [AARCH]) for each IPv6 interface SHOULD be generated as specified in [RFC7217]. Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

All implementations MUST support manual configuration of interface tokens to allow operators to manually change a interface token on a per-LL basis. Operators may choose to manually set interface tokens for reasons other than eliminating duplicate addresses.

All interface tokens MUST be 64 bits in length.

----- cut here ----- cut here -----

6.6. Update to [RFC2497](#)

The entire text of [Section 4 of \[RFC2497\]](#) is replaced with the following text:

----- cut here ----- cut here -----

The Interface Identifier [AARCH] for an ARCnet interface SHOULD be generated as specified in [RFC7217]. Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

----- cut here ----- cut here -----

The entire text of [Section 8 of \[RFC2497\]](#) is replaced with the following text:

----- cut here ----- cut here -----
Interface Identifiers generated as specified in [RFCXXXX] mitigate the security and privacy implications discussed in [Section 1](#) of such document.
----- cut here ----- cut here -----

6.7. Update to [RFC2590](#)

The entire [Section 4](#) and [Section 4.1 of \[RFC2590\]](#) is replaced with the following text:

----- cut here ----- cut here -----
4. Stateless Autoconfiguration

An interface identifier [AARCH] for an IPv6 Frame Relay interface MUST be unique on a Frame Relay link [AARCH], and MUST be unique on each of the virtual links represented by the VCs terminated on the interface.

The interface identifier for the Frame Relay interface SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

We note that each virtual circuit in a Frame Relay network is uniquely identified on a Frame Relay interface by a DLCI. Furthermore, a DLCI can be seen as an identification of the end point of a virtual circuit on a Frame Relay interface. Since each Frame Relay VC is configured or established separately, and acts like an independent virtual-link from other VCs in the network, or on the interface, link, wire or fiber, it seems beneficial to view each VC's termination point on the Frame Relay interface as a "pseudo-interface" or "logical-interface" overlaid on the Frame Relay interface. Furthermore, it seems beneficial to be able to generate and associate an IPv6 autoconfigured address (including an IPv6 link local address) to each "pseudo-interface", i.e. end-point of a VC, i.e. to each DLCI on a Frame Relay interface.

----- cut here ----- cut here -----

The entire [Section 9 of \[RFC2590\]](#) is replaced as follows:

----- cut here ----- cut here -----

9. Security Considerations

Security protection against forgery or accident at the level of the mechanisms described here is provided by the IPv6 security mechanisms [IPSEC], [IPSEC-Auth], [IPSEC-ESP] applied to Neighbor Discovery [IPv6-ND] or Inverse Neighbor Discovery [IND] messages.

To avoid an IPsec Authentication verification failure, the Frame Relay specific preprocessing of a Neighbor Discovery Solicitation message that contains a DLCI format Source link-layer address option, MUST be done by the receiver node after it completed IP Security processing.

----- cut here ----- cut here -----

6.8. Update to [RFC3146](#)

The entire [Section 6 of \[RFC3146\]](#) is replaced with the following text:

----- cut here ----- cut here -----

6. STATELESS AUTOCONFIGURATION

The Interface Identifier [AARCH] for an IEEE1394 interface SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

An IPv6 address prefix used for stateless autoconfiguration [ACONF] of an IEEE1394 interface MUST have a length of 64 bits.

----- cut here ----- cut here -----

6.9. Update to [RFC3315](#)

The following text in [Section 11](#) of [\[RFC3315\]](#):

----- cut here ----- cut here -----

Any address assigned by a server that is based on an EUI-64 identifier MUST include an interface identifier with the "u" (universal/local) and "g" (individual/group) bits of the interface identifier set appropriately, as indicated in section 2.5.1 of [RFC 2373](#) [5].

----- cut here ----- cut here -----

is formally replaced with:

----- cut here ----- cut here -----

By default, DHCPv6 server implementations SHOULD NOT generate predictable IPv6 addresses (such as IPv6 addresses where the IIDs are consecutive small numbers). [I-D.gont-dhcpv6-stable-privacy-addresses] specifies one possible algorithm that could be employed to comply with this requirement. Another possible algorithm would be to select a pseudo-random value chosen from a discrete uniform distribution, while avoiding the reserved IPv6 Interface Identifiers [RFC5453] [IANA-RESERVED-IID].

----- cut here ----- cut here -----

Additionally, the following references should be added to [Section 26](#) of [RFC3315](#):

----- cut here ----- cut here -----

[IANA-RESERVED-IID]

IANA, "Reserved IPv6 Interface Identifiers",
<<http://www.iana.org/assignments/ipv6-interface-ids>>.

[RFC5453] Krishnan, S., "Reserved IPv6 Interface Identifiers",
[RFC 5453](#), DOI 10.17487/RFC5453, February 2009,
<<http://www.rfc-editor.org/info/rfc5453>>.

[I-D.gont-dhcpv6-stable-privacy-addresses]

Gont, F. and S. LIU, "A Method for Generating Semantically Opaque Interface Identifiers with Dynamic Host Configuration Protocol for IPv6 (DHCPv6)",
[draft-gont-dhcpv6-stable-privacy-addresses-02](#) (work in progress), June 2016.

----- cut here ----- cut here -----

6.10. Update to [RFC3572](#)

The entire text of [Section 3 of RFC3572](#) is replaced as follows:

----- cut here ----- cut here -----

3. Interface Identifier

The Interface Identifier [AARCH] for a MAPOS interface SHOULD be generated as specified in [RFC7217](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

----- cut here ----- cut here -----

Additionally, [Section 6.2](#) ("Uniqueness of Interface Identifiers") of [RFC3572](#) is entirely eliminated.

6.11. Update to [RFC4291](#)

The entire text of [Section 2.5.1 of \[RFC4291\]](#) is replaced with the following text:

----- cut here ----- cut here -----

2.5.1. Interface Identifiers

Interface identifiers in IPv6 unicast addresses are used to identify interfaces on a link. They are required to be unique within a subnet prefix. It is recommended that the same interface identifier not be assigned to different nodes on a link. They may also be unique over a broader scope. The same interface identifier may be used on multiple interfaces on a single node, as long as they are attached to different subnets.

For all unicast addresses, except those that start with the binary value 000, Interface IDs are required to be 64 bits long, and SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

The details of forming interface identifiers are defined in the appropriate "IPv6 over <link>" specification, such as "IPv6 over Ethernet" [ETHER], and "IPv6 over FDDI" [FDDI].

----- cut here ----- cut here -----

6.12. Update to [RFC4338](#)

The entire text of [Section 5](#) (and of all the corresponding subsections) of [\[RFC4338\]](#) is replaced with the following text:

----- cut here ----- cut here -----

5. IPv6 Stateless Address Autoconfiguration

The IPv6 Interface ID [AARCH] for an Nx_Port SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

IPv6 stateless address autoconfiguration MUST be performed as specified in [ACONF]. An IPv6 Address Prefix used for stateless address autoconfiguration of an Nx_Port MUST have a length of 64 bits.

----- cut here ----- cut here -----

6.13. Update to [RFC4391](#)

The entire text of [Section 8 of \[RFC4391\]](#) is replaced with the following text:

----- cut here ----- cut here -----

8. IPv6 Stateless Autoconfiguration

The IPv6 Interface ID [AARCH] SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

----- cut here ----- cut here -----

6.14. Update to [RFC5072](#)

The entire text of [Section 4.1 of \[RFC5072\]](#) is replaced with the following text:

----- cut here ----- cut here -----

4.1. Interface Identifier

Description

This Configuration Option provides a way to negotiate a unique, 64-bit interface identifier to be used for the address autoconfiguration [3] at the local end of the link (see [Section 5](#)). A Configure-Request MUST contain exactly one instance of the interface-identifier option [1]. The interface identifier MUST be unique within the PPP link; i.e., upon completion of the negotiation, different interface-identifier values are to be selected for the ends of the PPP link.

Before this Configuration Option is requested, an implementation chooses its tentative interface identifier. The non-zero value of the tentative interface identifier SHOULD be chosen such that the value is unique to the link and, preferably, consistently reproducible across initializations of the IPV6CP finite state machine (administrative Close and reOpen, reboots, etc.). The rationale for preferring a consistently reproducible unique interface identifier to a completely random interface identifier is to provide stability to global scope addresses (see [Appendix A](#)) that can be formed from the interface identifier. Additionally, the tentative interface identifier SHOULD be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

If neither a unique number nor a random number can be generated, it is recommended that a zero value be used for the interface identifier transmitted in the Configure-Request. In this case, the PPP peer may

provide a valid non-zero interface identifier in its response as described below. Note that if at least one of the PPP peers is able to generate separate non-zero numbers for itself and its peer, the identifier negotiation will succeed.

When a Configure-Request is received with the Interface-Identifier Configuration Option and the receiving peer implements this option, the received interface identifier is compared with the interface identifier of the last Configure-Request sent to the peer. Depending on the result of the comparison, an implementation **MUST** respond in one of the following ways:

If the two interface identifiers are different but the received interface identifier is zero, a Configure-Nak is sent with a non-zero interface-identifier value suggested for use by the remote peer. Such a suggested interface identifier **MUST** be different from the interface identifier of the last Configure-Request sent to the peer. It is recommended that the value suggested be consistently reproducible across initializations of the IPV6CP finite state machine (administrative Close and reOpen, reboots, etc). Additionally, the value suggested **SHOULD** be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is **NOT RECOMMENDED** [RFCXXXX].

If the two interface identifiers are different and the received interface identifier is not zero, the interface identifier **MUST** be acknowledged, i.e., a Configure-Ack is sent with the requested interface identifier, meaning that the responding peer agrees with the interface identifier requested.

If the two interface identifiers are equal and are not zero, Configure-Nak **MUST** be sent specifying a different non-zero interface-identifier value suggested for use by the remote peer. It is recommended that the value suggested be consistently reproducible across initializations of the IPV6CP finite state machine (administrative Close and reOpen, reboots, etc). Additionally, the value suggested **SHOULD** be generated as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is **NOT RECOMMENDED** [RFCXXXX].

If the two interface identifiers are equal to zero, the interface identifier's negotiation **MUST** be terminated by transmitting the Configure-Reject with the interface-identifier value set to zero. In this case, a unique interface identifier cannot be negotiated.

If a Configure-Request is received with the Interface-Identifier Configuration Option and the receiving peer does not implement this option, Configure-Reject is sent.

A new Configure-Request SHOULD NOT be sent to the peer until normal processing would cause it to be sent (that is, until a Configure-Nak is received or the Restart timer runs out [1]).

A new Configure-Request MUST NOT contain the interface-identifier option if a valid Interface-Identifier Configure-Reject is received.

Reception of a Configure-Nak with a suggested interface identifier different from that of the last Configure-Nak sent to the peer indicates a unique interface identifier. In this case, a new Configure-Request MUST be sent with the identifier value suggested in the last Configure-Nak from the peer. But if the received interface identifier is equal to the one sent in the last Configure-Nak, a new interface identifier MUST be chosen. In this case, a new Configure-Request SHOULD be sent with the new tentative interface identifier. This sequence (transmit Configure-Request, receive Configure-Request, transmit Configure-Nak, receive Configure-Nak) might occur a few times, but it is extremely unlikely to occur repeatedly. More likely, the interface identifiers chosen at either end will quickly diverge, terminating the sequence.

If negotiation of the interface identifier is required, and the peer did not provide the option in its Configure-Request, the option SHOULD be appended to a Configure-Nak. The tentative value of the interface identifier given must be acceptable as the remote interface identifier; i.e., it should be different from the identifier value selected for the local end of the PPP link. The next Configure-Request from the peer may include this option. If the next Configure-Request does not include this option, the peer MUST NOT send another Configure-Nak with this option included. It should assume that the peer's implementation does not support this option.

By default, an implementation SHOULD attempt to negotiate the interface identifier for its end of the PPP connection.

A summary of the Interface-Identifier Configuration Option format is shown below. The fields are transmitted from left to right.

```

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   |   Length   | Interface-Identifier (MS Bytes)
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
                        Interface-Identifier (cont)
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
Interface-Identifier (LS Bytes) |
+---+---+---+---+---+---+---+---+---+---+---+---+

```


Type

1

Length

10

Interface-Identifier

The 64-bit interface identifier, which is very likely to be unique on the link, or zero if a good source of uniqueness cannot be found.

Default

If no valid interface identifier can be successfully negotiated, no default interface-identifier value should be assumed. The procedures for recovering from such a case will depend on the algorithm employed to generate the interface identifier. One approach is to manually configure the interface identifier of the interface.

----- cut here ----- cut here -----

Additionally, the following text of [Section 5 of \[RFC5072\]](#):

----- cut here ----- cut here -----

5. Stateless Autoconfiguration and Link-Local Addresses

The interface identifier of IPv6 unicast addresses [5] of a PPP interface SHOULD be negotiated in the IPV6CP phase of the PPP connection setup (see [Section 4.1](#)). If no valid interface identifier has been successfully negotiated, procedures for recovering from such a case are unspecified. One approach is to manually configure the interface identifier of the interface.

The negotiated interface identifier is used by the local end of the PPP link to autoconfigure an IPv6 link-local unicast address for the PPP interface. However, it SHOULD NOT be assumed that the same interface identifier is used in configuring global unicast addresses for the PPP interface using IPv6 stateless address autoconfiguration [3]. The PPP peer MAY generate one or more interface identifiers, for instance, using a method described in [8], to autoconfigure one or more global unicast addresses.

is formally replaced with the following text:

----- cut here ----- cut here -----

5. Stateless Autoconfiguration and Link-Local Addresses

The interface identifier of IPv6 unicast addresses [5] of a PPP interface SHOULD be negotiated in the IPV6CP phase of the PPP connection setup (see [Section 4.1](#)). If no valid interface identifier has been successfully negotiated, procedures for recovering from such a case will depend on the algorithm employed to generate the interface identifier. One approach is to manually configure the interface identifier of the interface.

The negotiated interface identifier is used by the local end of the PPP link to autoconfigure an IPv6 link-local unicast address for the PPP interface. However, it SHOULD NOT be assumed that the same interface identifier is used in configuring global unicast addresses for the PPP interface using IPv6 stateless address autoconfiguration [3].

----- cut here ----- cut here -----

6.15. Update to [RFC5121](#)

The entire text of [Section 9.1 of \[RFC5121\]](#) is replaced with the following text:

----- cut here ----- cut here -----

9.1. Interface Identifier

The MS SHOULD generate interface identifiers as specified in [\[RFC7217\]](#). Embedding a stable link-layer address in the IID is NOT RECOMMENDED [RFCXXXX].

----- cut here ----- cut here -----

Additionally, [Section 9.2](#) is replaced as follows:

----- cut here ----- cut here -----

9.2. Duplicate Address Detection

DAD SHOULD be performed as per "Neighbor Discovery for IP Version 6 (IPv6)", [[RFC4861](#)] and "IPv6 Stateless Address Autoconfiguration" [[RFC4862](#)]. The IPv6 link over 802.16 is specified in this document as a point-to-point link. Based on this criteria, it may be redundant to perform DAD on a global unicast address that is configured as part of the IPv6 Stateless Address Autoconfiguration Protocol [[RFC4862](#)] as long as the following two conditions are met:

1. The prefixes advertised through the router advertisement messages by the access router terminating the 802.16 IPv6 link are unique to that link.
2. The access router terminating the 802.16 IPv6 link does not autoconfigure any IPv6 global unicast addresses from the prefix that it advertises.

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7. Future Work

At the time of this writing, the mechanisms specified in the following documents might require updates to be fully compatible with the recommendations in this document:

- o "Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks" [[RFC6282](#)]
- o "Transmission of IPv6 Packets over IEEE 802.15.4 Networks" [[RFC4944](#)]
- o "Neighbor Discovery Optimization for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)" [[RFC6775](#)]
- o "Transmission of IPv6 Packets over ITU-T G.9959 Networks" [[RFC7428](#)]

Future revisions or updates of these documents should take the issues of privacy and security mentioned in [Section 1](#) and explain any design and engineering considerations that lead to the use of stable IIDs based on a node's link-layer address.

8. IANA Considerations

There are no IANA registries within this document. The RFC-Editor can remove this section before publication of this document as an RFC.

9. Security Considerations

This recommends against the (default) use of predictable Interface Identifiers in IPv6 addresses. It recommends [RFC7217] as the default scheme for generating IPv6 stable addresses with SLAAC, such that the security and privacy issues of IIDs that embed stable link-layer addresses are mitigated. Additionally, it recommends against predictable IIDs in DHCPv6 and manual configuration

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