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Guidelines and Registration Procedures for Interface Types and Tunnel Types

Abstract

This document provides guidelines and procedures for those who are defining, registering, or evaluating definitions of new interface types ("ifType" values) and tunnel types. The original definition of the IANA interface type registry predated the use of IANA Considerations sections and YANG modules, so some confusion arose over time. Tunnel types were added later, with the same requirements and allocation policy as interface types. This document updates RFC 2863 and provides updated guidance for these registries.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <https://www.rfc-editor.org/info/rfc8892>.

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1. Introduction

The IANA IfType-MIB, which contains the list of interface type (ifType) values, was originally defined in [RFC1573] as a separate MIB module together with the Interfaces Group MIB (IF-MIB) module. The IF-MIB module was subsequently updated and is currently specified in [RFC2863], but the latest IF-MIB RFC no longer contains the IANA IfType-MIB. Instead, the IANA IfType-MIB is maintained by IANA as a separate module. Similarly, [RFC7224] created an initial IANA Interface Type YANG Module, and the current version is maintained by IANA.

The current IANA IfType registry is at [ifType-registry], with the same values also appearing in both [yang-if-type] and the IANAifType textual convention at [IANAifType-MIB].

Although the ifType registry was originally defined in a MIB module, the assignment and use of interface type values are not tied to MIB modules or any other management mechanism. An interface type value can be used as the value of a data model object (MIB object, YANG object, etc.), as part of a unique identifier of a data model for a given interface type (e.g., in an OID), or simply as a value exposed by local APIs or UIs on a device.

The TUNNEL-MIB was defined in [RFC2667] (now obsoleted by [RFC4087]), which created a tunnelType registry ([tunnelType-registry] and the IANAtunnelType textual convention at [IANAifType-MIB]), and it defined the assignment policy for tunnelType values to always be identical to the policy for assigning ifType values.

2. Terminology

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. Problems

This document addresses the following issues:

1. As noted in Section 1, the original guidance was written with wording specific to MIB modules; accordingly, some confusion has resulted when using YANG modules. This document clarifies that ifTypes and tunnelTypes are independent from the type of, or even existence of, a data model.
2. The use of and requirements around sub-layers and sub-types were not well understood, but good examples of both now exist. This is discussed in Section 4.
3. Since the "Interface Types (ifType)" and "Tunnel Types (tunnelType)" registries were originally defined, and are still retrievable, in the format of MIB modules (in addition to other

formats), confusion arose when adding YANG modules as another format as to whether each is a separate registry. This is discussed in Section 5.

4. The registries are retrievable in the format of MIB and YANG modules, but there was previously no process guidance written to check that those formats were syntactically correct as updates were made, which led to the registry having syntax errors that broke tools. Section 6.1 adds a validation step to the documented assignment procedure.
5. Various documents and registries previously said to submit requests via email, but a web form exists for submitting requests, which caused some confusion around which was to be used. This is addressed in Section 6.1.
6. Transmission values [transmission-registry] have generally been allocated as part of ifType allocation, but no guidance existed as to whether a requester must ask for it or not, and the request form had no such required field. As a result, IANA has asked the designated expert to decide for each allocation, but no relevant guidance for the designated expert has been documented. This is remedied in Section 6.2.

4. Interface Sub-layers and Sub-types

When multiple sub-layers exist below the network layer, each sub-layer can be represented by its own row in the ifTable with its own ifType, with the ifStackTable being used to identify the upward and downward multiplexing relationships between rows. Section 3.1.1 of [RFC2863] provides more discussion, and 3.1.2 provides guidance for defining interface sub-layers. More recent experience shows that those guidelines were phrased in a way that is now too restrictive, since at the time [RFC2863] was written, MIB modules were the dominant data model.

This document clarifies that the same guidance also applies to YANG modules.

Some ifTypes may define sub-types. For example, the tunnel(131) ifType defines sub-types known as "tunnelTypes", where each tunnelType can have its own MIB and/or YANG module with protocol-specific information, but there is enough in common that some information is exposed in a generic IP Tunnel MIB corresponding to the tunnel(131) ifType.

For requests that involve multiple sub-layers below the network layer, requests MUST include (or reference) a discussion of the multiplexing relationships between sub-layers, ideally with a diagram. Various well-written examples exist of such definitions, including Section 3.4.1 of [RFC3637], Section 3.1.1 of [RFC4087], and Section 3.1.1 of [RFC5066].

Definers of sub-layers and sub-types should consider which model is more appropriate for their needs. A sub-layer is generally used whenever either a dynamic relationship exists (i.e., when the set of instances above or below a given instance can change over time) or a multiplexing relationship exists with another sub-layer. A sub-type can be used when neither of these is true but where one interface type is conceptually a subclass of another interface type, as far as a management data model is concerned.

In general, the intent of an interface type or sub-type is that its definition should be sufficient to identify an interoperable protocol. In some cases, however, a protocol might be defined in a way that is not sufficient to provide interoperability with other

compliant implementations of that protocol. In such a case, an ifType definition should discuss whether specific instantiations (or profiles) of behavior should use a sub-layer model (e.g., each vendor might layer the protocol over its own sub-layer that provides the missing details) or a sub-type model (i.e., each vendor might subclass the protocol without any layering relationship). If a sub-type model is more appropriate, then the data model for the protocol might include a sub-type identifier so that management software can discover objects specific to the sub-type. In either case, such discussion is important to guide definers of a data model for the more specific information (i.e., a lower sub-layer or a sub-type), as well as the designated expert, who must review requests for any such ifTypes or sub-types.

4.1. Alternate Values

Another design decision is whether to reuse an existing ifType or tunnelType value, possibly using a sub-type or sub-layer model for refinements, or to use a different value for a new mechanism.

If there is already an entry that could easily satisfy the modeling and functional requirements for the requested entry, it should be reused so that applications and tools that use the existing value can be used without changes. If, however, the modeling and functional requirements are significantly different enough such that having existing applications and tools use the existing value would be seen as a problem, a new value should be used.

For example, originally different ifType values were used for different flavors of Ethernet (ethernetCsmacd(6), iso88023Csmacd(7), fastEther(62), etc.), typically because they were registered by different vendors. Using different values was, however, seen as problematic because all were functionally similar, so [RFC3635] then deprecated all but ethernetCsmacd(6).

As another example, a udp(8) tunnelType value was defined in [RFC2667] with the description "The value UDP indicates that the payload packet is encapsulated within a normal UDP packet (e.g., RFC 1234)." The Teredo tunnel protocol [RFC4380] was later defined and encapsulates packets over UDP, but the protocol model is quite different between [RFC1234] and Teredo. For example, [RFC1234] supports encapsulation of multicast/broadcast traffic, whereas Teredo does not. As such, it would be more confusing to applications and tools to represent them using the same tunnel type, and so [RFC4087] defined a new value for Teredo.

In summary, definers of new interface or tunnel mechanisms should use a new ifType or tunnelType value rather than reuse an existing value when key aspects such as the header format or the link model (point-to-point, non-broadcast multi-access, broadcast-capable multi-access, unidirectional broadcast, etc.) are significantly different from existing values, but they should reuse the same value when the differences can be expressed in terms of differing values of existing objects other than ifType/tunnelType in the standard YANG or MIB module.

5. Available Formats

Many registries are available in multiple formats. For example, XML, HTML, CSV, and plain text are common formats in which many registries are available. This document clarifies that the [IANAifType-MIB], [yang-if-type], and [yang-tunnel-type] MIB and YANG modules are merely additional formats in which the "Interface Types (ifType)" and "Tunnel Types (tunnelType)" registries are available. The MIB and YANG modules are not separate registries, and the same values are always present in all formats of the same registry.

The confusion stemmed in part from the fact that the IANA "Protocol Registries" [protocol-registries] listed the YANG and MIB module formats separately, as if they were separate registries. However, the entries for the yang-if-type and iana-tunnel-type YANG modules said "See ifType definitions registry" and "See tunnelType registry (mib-2.interface.ifTable.ifEntry.ifType.tunnelType)" respectively, although the entry for the IANAifType-MIB had no such note. Section 7.1 addresses this.

6. Registration

The IANA policy (using terms defined in [RFC8126]) for registration is Expert Review for both interface types and tunnel types. The role of the designated expert in the procedure is to raise possible concerns about wider implications of proposals for use and deployment of interface types. While it is recommended that the responsible Area Director and the IESG take into consideration the designated expert opinions, nothing in the procedure empowers the designated expert to override properly arrived-at IETF or working group consensus.

6.1. Procedures

Someone wishing to register a new ifType or tunnelType value MUST:

1. Check the IANA registry to see whether there is already an entry that could easily satisfy the modeling and functional requirements for the requested entry. If there is already such an entry, use it or update the existing specification. Text in an Internet-Draft or part of some permanently available, stable specification may be written to clarify the usage of an existing entry or entries for the desired purpose.
2. Check the IANA registry to see whether there is already some other entry with the desired name. If there is already an unrelated entry under the desired name, choose a different name.
3. Prepare a registration request using the template specified in Section 6.3. The registration request can be contained in an Internet-Draft, submitted alone, or submitted as part of some permanently available, stable specification. The registration request can also be submitted in some other form (as part of another document or as a stand-alone document), but the registration request will be treated as an "IETF Contribution" under the guidelines of [RFC5378].
4. Submit the registration request (or pointer to a document containing it) to IANA at iana@iana.org or (if requesting an ifType) via the web form at <https://www.iana.org/form/iftypes>.

Upon receipt of a registration request, the following steps MUST be followed:

1. IANA checks the submission for completeness; if required information is missing or any citations are not correct, IANA will reject the registration request. A registrant can resubmit a corrected request if desired.
2. IANA requests Expert Review of the registration request against the corresponding guidelines from this document.
3. The designated expert will evaluate the request against the criteria.
4. Once the designated expert approves a registration, IANA updates

[ifType-registry], [IANAifType-MIB], and [yang-if-type] to show the registration for an interface type, or [tunnelType-registry], [IANAifType-MIB], and [yang-tunnel-type] to show the registration for a tunnel type. When adding values, IANA should verify that the updated MIB module and YANG module formats are syntactically correct before publishing the update. There are various existing tools or websites that can be used to do this verification.

5. If instead the designated expert does not approve registration (e.g., for any of the reasons in [RFC8126], Section 5), a registrant can resubmit a corrected request if desired, or the IESG can override the designated expert and approve it per the process in Section 3.3 of [RFC8126].

6.2. Media-Specific OID-Subtree Assignments

[IANAifType-MIB] notes:

The relationship between the assignment of ifType values and of OIDs to particular media-specific MIBs is solely the purview of IANA and is subject to change without notice. Quite often, a media-specific MIB's OID-subtree assignment within MIB-II's 'transmission' subtree will be the same as its ifType value. However, in some circumstances this will not be the case, and implementors must not pre-assume any specific relationship between ifType values and transmission subtree OIDs.

The advice above remains unchanged, but this document changes the allocation procedure to streamline the process, so that an ifType value and a transmission number value with the same value will be assigned at the same time.

Rationale:

- (1) This saves future effort if a transmission number is later deemed necessary, since no IANA request is needed that would then require another Expert Review.
- (2) The transmission numbering space is not scarce, so there seems to be little need to reserve the number for a different purpose than what the ifType is for.
- (3) The designated expert need not review whether a transmission number value should be registered when processing each ifType request, thus reducing the possibility of delaying assignment of ifType values.
- (4) There is no case on record where allocating the same value could have caused any problems.

6.3. Registration Template

6.3.1. ifType

The following template describes the fields that **MUST** be supplied in a registration request suitable for adding to the "Interface Types (ifType)" registry:

Label for IANA ifType requested: As explained in Section 7.1.1 of [RFC2578], a label for a named-number enumeration must consist of one or more letters or digits, up to a maximum of 64 characters, and the initial character must be a lowercase letter. (However, labels longer than 32 characters are not recommended.) Note that hyphens are not allowed.

Name of IANA ifType requested: A short description (e.g., a protocol

name) suitable to appear in a comment in the registry.

Description of the proposed use of the IANA ifType: Requesters MUST include answers, either directly or via a link to a document with the answers, to the following questions in the explanation of the proposed use of the IANA IfType:

- * How would IP run over your ifType?
- * Would there be another interface sub-layer between your ifType and IP?
- * Would your ifType be vendor specific / proprietary? (If so, the label MUST start with a string that shows that. For example, if your company's name or acronym is xxx, then the ifType label would be something like xxxSomeIfTypeLabel.)
- * Would your ifType require or allow vendor-specific extensions? If so, would the vendor use their own ifType in a sub-layer below the requested ifType, a sub-type of the ifType, or some other mechanism?

Reference, Internet-Draft, or Specification: A link to a document is required.

Additional information or comments: Optional; any additional comments for IANA or the designated expert.

6.3.2. tunnelType

Prior to this document, no form existed for tunnelType (and new tunnelType requests did not need to use the ifType form that did exist). This document therefore specifies a tunnelType form.

The following template describes the fields that MUST be supplied in a registration request suitable for adding to the "Tunnel Types (tunnelType)" registry:

Label for IANA tunnelType requested: As explained in Section 7.1.1 of [RFC2578], a label for a named-number enumeration must consist of one or more letters or digits, up to a maximum of 64 characters, and the initial character must be a lowercase letter. (However, labels longer than 32 characters are not recommended.) Note that hyphens are not allowed.

Name of IANA tunnelType requested: A short description (e.g., a protocol name) suitable to appear in a comment in the registry.

Description of the proposed use of the IANA tunnelType: Requesters MUST include answers, either directly or via a link to a document with the answers, to the following questions in the explanation of the proposed use of the IANA tunnelType:

- * How would IP run over your tunnelType?
- * Would there be another interface sub-layer between your tunnelType and IP?
- * Would your tunnelType be vendor-specific or proprietary? (If so, the label MUST start with a string that shows that. For example, if your company's name or acronym is xxx, then the tunnelType label would be something like xxxSomeTunnelTypeLabel.)
- * Would your tunnelType require or allow vendor-specific extensions? If so, would the vendor use their own tunnelType

in a sub-layer below the requested tunnelType, or some sort of sub-type of the tunnelType, or some other mechanism?

Reference, Internet-Draft, or Specification: A link to a document is required.

Additional information or comments: Optionally any additional comments for IANA or the designated expert.

7. IANA Considerations

This entire document is about IANA considerations, but this section discusses actions taken by and to be taken by IANA. There are three registries affected:

1. Interface Types (ifType) [ifType-registry]: The registration process is updated in Section 6.1, and the template is updated in Section 6.3.1.
2. Tunnel Types (tunnelType) [tunnelType-registry]: The registration process is updated in Section 6.1, and the template is updated in Section 6.3.2.
3. Transmission Number Values [transmission-registry]: The assignment process is updated in Section 6.2.

At the time of publication of this document, IANA is unable to perform some of the actions requested below due to limitations of their current platform and toolset. In such cases, IANA is requested to perform these actions as and when the migration to a new platform that would enable these actions is complete.

7.1. MIB and YANG Modules

IANA is to complete the following to clarify the relationship between MIB modules, YANG modules, and the relevant registries.

1. The following note has been added to the IANAifType-MIB at [protocol-registries]: "This is one of the available formats of the Interface Types (ifType) and Tunnel Types (tunnelType) registries."
2. The note for the iana-if-type YANG module at [protocol-registries] has been updated to read: "This is one of the available formats of the Interface Types (ifType) registry."
3. The note for the iana-tunnel-type YANG module at [protocol-registries] has been updated to read: "This is one of the available formats of the Tunnel Types (tunnelType) registry."
4. The new "Interface Parameters" category at [protocol-registries] includes entries for "Interface Types (ifType)" [ifType-registry], "Tunnel Types (tunnelType)" [tunnelType-registry], and "Transmission Number Values" [transmission-registry].
5. Update the "Interface Types (ifType)" registry [ifType-registry] to list MIB [IANAifType-MIB] and YANG [yang-if-type] as Available Formats.
6. Update the "Tunnel Types (tunnelType)" registry [tunnelType-registry] to list MIB [IANAifType-MIB] and YANG [yang-tunnel-type] as Available Formats.
7. Replace the [yang-if-type] page with the YANG module content

rather than having a page that claims to have multiple Available Formats.

8. Replace the [yang-tunnel-type] page with the YANG module content rather than having a page that claims to have multiple Available Formats.
9. In addition, [IANAifType-MIB] is to be updated as follows:

OLD:

```
| Requests for new values should be made to IANA via email
| (iana@iana.org).
```

NEW:

```
| Interface types must not be directly added to the IANAifType-
| MIB MIB module. They must instead be added to the "Interface
| Types (ifType)" registry at [ifType-registry].
```

(Note that [yang-if-type] was previously updated with this language.)

10. IANA has added this document as a reference in the "Interface Types (ifType)", "Tunnel Types (tunnelType)", and "Transmission Number Values" registries, as well as the iana-if-type YANG Module, iana-tunnel-type YANG Module, and IANAifType-MIB.

7.2. Transmission Number Assignments

Per the discussion in Section 6.2, [ifType-registry] has been updated as follows:

OLD:

```
| For every ifType registration, the corresponding transmission
| number value should be registered or marked "Reserved".
```

NEW:

```
| For future ifType assignments, an OID-subtree assignment MIB-II's
| 'transmission' subtree will be made with the same value.
```

Similarly, the following change has been made to [transmission-registry]:

OLD:

```
| For every transmission number registration, the corresponding
| ifType value should be registered or marked "Reserved".
```

NEW:

```
| For future transmission number assignments, an 'ifType' will be
| made with the same value.
```

8. Security Considerations

Since this document does not introduce any technology or protocol, there are no security issues to be considered for this document itself.

For security considerations related to MIB and YANG modules that expose these values, see Section 9 of [RFC2863], Section 6 of [RFC4087], and Section 3 of [RFC8675].

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