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Guidelines for Writing an IANA Considerations Section in RFCs
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Abstract

Many protocols make use of identifiers consisting of constants and other well-known values. Even after a protocol has been defined and deployment has begun, new values may need to be assigned (such as for a new option type in DHCP, or a new encryption or authentication transform for IPsec). To ensure that such quantities have consistent values and interpretations across all implementations, their assignment must be administered by a central authority. For IETF protocols, that role is provided by the Internet Assigned Numbers Authority (IANA).

In order for IANA to manage a given namespace prudently, it needs guidelines describing the conditions under which new values can be assigned or when modifications to existing values can be made. If IANA is expected to play a role in the management of a namespace, IANA must be given clear and concise instructions describing that role. This document discusses issues that should be considered in formulating a policy for assigning values to a namespace and provides guidelines for authors on the specific text that must be included in documents that place demands on IANA.

This document obsoletes RFC 5226.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

Many protocols make use of fields that contain constants and other well-known values (such as the Protocol field in the IP header [RFC0791] and MIME media types [RFC4288]). Even after a protocol has been defined and deployment has begun, new values may need to be assigned (such as a new option type in DHCP [RFC2132] or a new encryption or authentication transform for IPsec [RFC4301]). To ensure that such fields have consistent values and interpretations in different implementations, their assignment must be administered by a central authority. For IETF protocols, that role is provided by the Internet Assigned Numbers Authority (IANA) [RFC2860].

In this document, we call the set of possible values for such a field a "namespace"; its actual value may be a text string, a number, or another kind of value. The binding or association of a specific value with a particular purpose within a namespace is called an assigned number (or assigned value, or sometimes a "code point", "protocol constant", or "protocol parameter"). Each assignment of a value in a namespace is called a registration.

In order for IANA to manage a given namespace prudently, it needs guidelines describing the conditions under which new values should be assigned or when (and how) modifications to existing values can be made. This document provides guidelines to authors on what sort of text should be added to their documents in order to provide IANA clear guidelines, and it reviews issues that should be considered in formulating an appropriate policy for assigning numbers to name spaces.

Not all namespaces require centralized administration. In some cases, it is possible to delegate a namespace in such a way that further assignments can be made independently and with no further (central) coordination. In the Domain Name System, for example, IANA only deals with assignments at the higher levels, while subdomains are administered by the organization to which the space has been delegated. As another example, Object Identifiers (OIDs) as defined by the ITU are also delegated [RFC3232]; IANA manages the subtree rooted at "iso.org.dod.internet" (1.3.6.1) . When a namespace is delegated, the scope of IANA is limited to the parts of the namespace where IANA has authority.

1.1. Terminology Used In This Document

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]. For this document, "the specification" as used by RFC 2119 refers to

the processing of protocol documents within the IETF standards process.

2. Why Management of a Namespace May Be Necessary

One issue to consider in managing a namespace is its size. If the space is small and limited in size, assignments must be made carefully to prevent exhaustion of the space. If the space is essentially unlimited, on the other hand, potential exhaustion will probably not be a practical concern at all. Even when the space is essentially unlimited, however, it is usually desirable to have at least a minimal review prior to assignment in order to:

- prevent the hoarding of or unnecessary wasting of values. For example, if the space consists of text strings, it may be desirable to prevent entities from obtaining large sets of strings that correspond to desirable names (existing company names, for example).

- provide a sanity check that the request actually makes sense and is necessary. Experience has shown that some level of minimal review from a subject matter expert is useful to prevent assignments in cases where the request is malformed or not actually needed (for example, an existing assignment for an essentially equivalent service already exists).

A second consideration is whether it makes sense to delegate the namespace in some manner. This route should be pursued when appropriate, as it lessens the burden on IANA for dealing with assignments.

A third, and perhaps most important, consideration concerns potential impact on the interoperability of unreviewed extensions. Proposed protocol extensions generally benefit from community review; indeed, review is often essential to avoid future interoperability problems [I-D.iab-extension-recs].

When the namespace is essentially unlimited and there are no potential interoperability issues, assigned numbers can safely be given out to anyone without any subjective review. In such cases, IANA can make assignments directly, provided that IANA is given specific instructions on what types of requests it should grant, and what information must be provided as part of a well-formed request for an assigned number.

3. Designated Experts

3.1. The Motivation for Designated Experts

It should be noted that IANA does not create or define assignment policy itself; rather, it carries out policies that have been defined by others and published in RFCs. IANA must be given a set of guidelines that allow it to make allocation decisions with minimal subjectivity and without requiring any technical expertise with respect to the protocols that make use of a registry.

In many cases, some review of prospective allocations is appropriate, and the question becomes who should perform the review and what is the purpose of the review. One might think that an IETF working group familiar with the namespace at hand should be consulted. In practice, however, working groups eventually disband, so they cannot be considered a permanent evaluator. It is also possible for namespaces to be created through individual submission documents, for which no working group is ever formed.

One way to ensure community review of prospective assignments is to have the requester submit a document for publication as an RFC. Such an action helps ensure that the specification is publicly and permanently available, and it allows some review of the specification prior to publication and assignment of the requested code points. This is the preferred way of ensuring review, and is particularly important if any potential interoperability issues can arise. For example, some assignments are not just assignments, but also involve an element of protocol specification. A new option may define fields that need to be parsed and acted on, which (if specified poorly) may not fit cleanly with the architecture of other options or the base protocols on which they are built.

In some cases, however, the burden of publishing an RFC in order to get an assignment is excessive. However, it is generally still useful (and sometimes necessary) to discuss proposed additions on a mailing list dedicated to the purpose (such as the media-types@iana.org for media types) or on a more general mailing list (such as that of a current or former IETF working group). Such a mailing list provides a way for new registrations to be publicly reviewed prior to getting assigned, or gives advice to persons wanting help in understanding what a proper registration should contain.

While discussion on a mailing list can provide valuable technical feedback, opinions may vary and discussions may continue for some time without clear resolution. In addition, IANA cannot participate in all of these mailing lists and cannot determine if or when such

discussions reach consensus. Therefore, IANA relies on a "designated expert" for advice regarding the specific question of whether an assignment should be made. The designated expert is an individual who is responsible for carrying out an appropriate evaluation and returning a recommendation to IANA.

It should be noted that a key motivation for having designated experts is for the IETF to provide IANA with a subject matter expert to whom the evaluation process can be delegated. IANA forwards requests for an assignment to the expert for evaluation, and the expert (after performing the evaluation) informs IANA as to whether or not to make the assignment or registration.

3.2. The Role of the Designated Expert

The designated expert is responsible for initiating and coordinating the appropriate review of an assignment request. The review may be wide or narrow, depending on the situation and the judgment of the designated expert. This may involve consultation with a set of technology experts, discussion on a public mailing list, consultation with a working group (or its mailing list if the working group has disbanded), etc. Ideally, the designated expert follows specific review criteria as documented with the protocol that creates or uses the namespace. See the IANA Considerations sections of [RFC3748] and [RFC3575] for examples that have been done for specific namespaces.

Designated experts are expected to be able to defend their decisions to the IETF community, and the evaluation process is not intended to be secretive or bestow unquestioned power on the expert. Experts are expected to apply applicable documented review or vetting procedures, or in the absence of documented criteria, follow generally accepted norms such as those in Section 3.3.

Section 5.2 discusses disputes and appeals in more detail.

Designated experts are appointed by the IESG (normally upon recommendation by the relevant Area Director). They are typically named at the time a document creating or updating a namespace is approved by the IESG, but as experts originally appointed may later become unavailable, the IESG will appoint replacements if necessary.

For some registries, it has proven useful to have multiple designated experts. Sometimes those experts work together in evaluating a request, while in other cases additional experts serve as backups. In cases of disagreement among those experts, it is the responsibility of those experts to make a single clear recommendation to IANA. It is not appropriate for IANA to resolve disputes among experts. In extreme situations, such as deadlock, the IESG may need

to step in to resolve the problem.

In registries where a pool of experts evaluates requests, the pool should have a single chair responsible for defining how requests are to be assigned to and reviewed by experts. In some cases, the expert pool may consist of a primary and backups, with the backups involved only when the primary expert is unavailable. In other cases, IANA might assign requests to individual members in sequential or approximate random order. In the event that IANA finds itself having received conflicting advice from its experts, it is the responsibility of the pool's chair to resolve the issue and provide IANA with clear instructions.

Since the designated experts are appointed by the IESG, they may be removed by the IESG.

3.3. Designated Expert Reviews

In the years since RFC 2434 was published and has been put to use, experience has led to the following observations:

- A designated expert must respond in a timely fashion, normally within a week for simple requests to a few weeks for more complex ones. Unreasonable delays can cause significant problems for those needing assignments, such as when products need code points to ship. This is not to say that all reviews can be completed under a firm deadline, but they must be started, and the requester and IANA should have some transparency into the process if an answer cannot be given quickly.

- If a designated expert does not respond to IANA's requests within a reasonable period of time, either with a response or with a reasonable explanation for the delay (some requests may be particularly complex), and if this is a recurring event, IANA must raise the issue with the IESG. Because of the problems caused by delayed evaluations and assignments, the IESG should take appropriate actions to ensure that the expert understands and accepts his or her responsibilities, or appoint a new expert.

- The designated expert is not required to personally bear the burden of evaluating and deciding all requests, but acts as a shepherd for the request, enlisting the help of others as appropriate. In the case that a request is denied, and rejecting the request is likely to be controversial, the expert should have the support of other subject matter experts. That is, the expert must be able to defend a decision to the community as a whole.

When a designated expert is used, the documentation should give clear

guidance to the designated expert, laying out criteria for performing an evaluation and reasons for rejecting a request. In the case where there are no specific documented criteria, the presumption should be that a code point should be granted unless there is a compelling reason to the contrary. Possible reasons to deny a request include these:

- Scarcity of code points, where the finite remaining code points should be prudently managed, or when a request for a large number of code points is made, when a single code point is the norm.

- Documentation is not of sufficient clarity to evaluate or ensure interoperability.

- The code point is needed for a protocol extension, but the extension is not consistent with the documented (or generally understood) architecture of the base protocol being extended, and would be harmful to the protocol if widely deployed. It is not the intent that "inconsistencies" refer to minor differences "of a personal preference nature". Instead, they refer to significant differences such as inconsistencies with the underlying security model, implying a change to the semantics of an existing message type or operation, requiring unwarranted changes in deployed systems (compared with alternate ways of achieving a similar result), etc.

- The extension would cause problems with existing deployed systems.

- The extension would conflict with one under active development by the IETF, and having both would harm rather than foster interoperability.

3.4. Expert Reviews and the Document Lifecycle

Review by the designated expert is necessarily done at a particular point in time, and represents review of a particular version of the document. Deciding when the review should take place is a question of good judgment. And while re-reviews might be done when it's acknowledged that the documentation of the registered item has changed substantially, making sure that re-review happens requires attention and care.

It is possible, through carelessness, accident, inattentiveness, or even willful disregard, that changes might be made after the designated expert's review and approval that would, if the document were re-reviewed, cause the expert not to approve the registration. It is up to the IESG, with the token held by the responsible Area Director, to be alert to such situations and to recognize that such

changes need to be checked.

4. Creating a Registry

Creating a registry involves describing the namespaces to be created, an initial set of assignments (if appropriate), and guidelines on how future assignments are to be made.

Once a registry has been created, IANA records assignments that have been made. The following labels describe the status of an individual (or range) of assignments:

Private Use: Private use only (not assigned), as described in Section 4.1.1.

Experimental: Available for general experimental use as described in [RFC3692]. IANA does not record specific assignments for any particular use.

Unassigned: Not currently assigned, and available for assignment via documented procedures. While it's generally clear that any values that are not registered are unassigned and available for assignment, it is sometimes useful to explicitly specify that situation. Note that this is distinctly different from "Reserved".

Reserved: Not assigned and not available for assignment. Reserved values are held for special uses, such as to extend the namespace when it becomes exhausted. Note that this is distinctly different from "Unassigned".

4.1. Well-Known IANA Policy Definitions

The following are some defined policies, most of which are in use today. These cover a range of typical policies that have been used to describe the procedure for assigning new values in a namespace. It is not strictly required that documents use these terms; the actual requirement is that the instructions to IANA be clear and unambiguous. However, use of these terms is strongly RECOMMENDED, because their meanings are widely understood. The terms are fully explained in the following subsections.

1. Private Use
2. Experimental Use
3. Hierarchical Allocation
4. First Come First Served
5. Expert Review
6. Specification Required
7. RFC Required
8. IETF Review
9. Standards Action
10. IESG Approval

It should be noted that it often makes sense to partition a namespace into multiple categories, with assignments within each category handled differently. Many protocols now partition namespaces into two or more parts, with one range reserved for Private or Experimental Use while other ranges are reserved for globally unique assignments assigned following some review process. Dividing a namespace into ranges makes it possible to have different policies in place for different ranges and different use cases.

Examples:
LDAP [RFC4520]
TLS ClientCertificateType Identifiers [RFC5246] (as detailed in the subsections below)
Pseudowire Edge to Edge Emulation (PWE3) [RFC4446]

4.1.1. Policy: Private Use

For private or local use only, with the type and purpose defined by the local site. No attempt is made to prevent multiple sites from using the same value in different (and incompatible) ways. There is no need for IANA to review such assignments (since IANA does not record them) and assignments are not generally useful for broad interoperability. It is the responsibility of the sites making use of the Private Use range to ensure that no conflicts occur (within the intended scope of use).

Examples:
Site-specific options in DHCP [RFC2939]
Fibre Channel Port Type Registry [RFC4044]
TLS ClientCertificateType Identifiers 224-255 [RFC5246]

4.1.2. Policy: Experimental Use

Similar to private or local use only, with the purpose being to facilitate experimentation. See [RFC3692] for details.

Example:

Experimental Values in IPv4, IPv6, ICMPv4, ICMPv6, UDP, and TCP Headers [RFC4727]

4.1.3. Policy: Hierarchical Allocation

Delegated managers can assign values provided they have been given control over that part of the namespace. IANA controls the higher levels of the namespace according to one of the other policies.

Examples:
- DNS names
- Object Identifiers
- IP addresses

4.1.4. Policy: First Come First Served

Assignments are made to anyone on a first come, first served basis. There is no substantive review of the request, other than to ensure that it is well-formed and doesn't duplicate an existing assignment. However, requests must include a minimal amount of clerical information, such as a point of contact (including an email address) and a brief description of how the value will be used. Additional information specific to the type of value requested may also need to be provided, as defined by the namespace. For numbers, the exact value is generally assigned by IANA; with names, specific text strings can usually be requested.

Examples:
- SASL mechanism names [RFC4422]
- LDAP Protocol Mechanisms and LDAP Syntax [RFC4520]

4.1.5. Policy: Expert Review

(Sometimes also called "Designated Expert" in earlier editions of this document.) Approval by a designated expert is required. The required documentation and review criteria for use by the designated expert should be provided when defining the registry. For example, see Sections 6 and 7.2 in [RFC3748].

It is particularly important, when using a designated expert, to give clear guidance to the expert, laying out criteria for performing an evaluation and reasons for rejecting a request. When specifying a policy that involves a designated expert, the IANA Considerations SHOULD contain such guidance. It is also a good idea to include, when possible, a sense of whether many registrations are expected over time, or if the registry is expected to be updated infrequently or in exceptional circumstances only.

Examples:
EAP Method Types [RFC3748]
HTTP Digest AKA algorithm versions [RFC4169]
URI schemes [RFC4395]
GEOPRIV Location Types [RFC4589]

4.1.6. Policy: Specification Required

Values and their meanings must be documented in a permanent and readily available public specification, in sufficient detail so that interoperability between independent implementations is possible. When used, Specification Required also implies use of a Designated Expert (see Section 4.1.5), who will review the public specification and evaluate whether it is sufficiently clear to allow interoperable implementations. The intention behind "permanent and readily available" is that a document can reasonably be expected to be findable and retrievable long after IANA assignment of the requested value. Publication of an RFC is an ideal means of achieving this requirement, but Specification Required is intended to also cover the case of a document published outside of the RFC path. For RFC publication, the normal RFC review process is expected to provide the necessary review for interoperability, though the designated expert may be a particularly well-qualified person to perform such a review.

When specifying this policy, just use the term "Specification Required". Some specifications have chosen to refer to it as "Expert Review with Specification Required", and that only causes confusion.

Examples:
Diffserv-aware TE Bandwidth Constraints Model Identifiers [RFC4124]
TLS ClientCertificateType Identifiers 64-223 [RFC5246]
ROHC Profile Identifiers [RFC5795]

4.1.7. Policy: RFC Required

RFC publication suffices, as an IETF submission or in any other stream (currently an RFC Editor Independent Submission [RFC5742] or an RFC in the IRTF or IAB Stream). Unless otherwise specified, any type of RFC is sufficient (currently Standards Track, BCP, Informational, Experimental, Historic).

4.1.8. Policy: IETF Review

(Formerly called "IETF Consensus" in the first edition of this document.) New values are assigned only through RFCs in the IETF Stream -- those that have been shepherded through the IESG as AD-Sponsored or IETF working group Documents [RFC2026] [RFC5378]. The

intention is that the document and proposed assignment will be reviewed by the IESG and appropriate IETF working groups (or experts, if suitable working groups no longer exist) to ensure that the proposed assignment will not negatively impact interoperability or otherwise extend IETF protocols in an inappropriate or damaging manner.

To ensure adequate community review, such documents are shepherded through the IESG as AD-sponsored or working group documents with an IETF Last Call.

Examples:
IPSECKEY Algorithm Types [RFC4025]
Accounting-Auth-Method AVP values in DIAMETER [RFC4005]
TLS Extension Types [RFC5246]

4.1.9. Policy: Standards Action

Values are assigned only for Standards Track RFCs approved by the IESG.

Examples:
BGP message types [RFC4271]
Mobile Node Identifier option types [RFC4283]
TLS ClientCertificateType Identifiers 0-63 [RFC5246]
DCCP Packet Types [RFC4340]

4.1.10. Policy: IESG Approval

New assignments may be approved by the IESG. Although there is no requirement that the request be documented in an RFC, the IESG has discretion to request documents or other supporting materials on a case-by-case basis.

IESG Approval is not intended to be used often or as a "common case"; indeed, it has seldom been used in practice during the period RFC 2434 was in effect. Rather, it is intended to be available in conjunction with other policies as a fall-back mechanism in the case where one of the other allowable approval mechanisms cannot be employed in a timely fashion or for some other compelling reason. IESG Approval is not intended to circumvent the public review processes implied by other policies that could have been employed for a particular assignment. IESG Approval would be appropriate, however, in cases where expediency is desired and there is strong consensus (such as from a working group) for making the assignment.

The following guidelines are suggested for any evaluation under IESG Approval:

- The IESG can (and should) reject a request if another path for registration is available that is more appropriate and there is no compelling reason not to use that path.

- Before approving a request, the community should be consulted, via a "call for comments" that provides as much information as is reasonably possible about the request.

Examples:
IPv4 Multicast address assignments [RFC5771]
IPv4 IGMP Type and Code values [RFC3228]
Mobile IPv6 Mobility Header Type and Option values [RFC6275]

4.2. Best Practice for Selecting an Appropriate Policy

The definitions above from "First Come First Served" to "Standards Action" specify a range of policies in increasing order of strictness:

4. First Come First Served:
   No review, minimal documentation.

5. Expert Review:
   Expert review, sufficient documentation for review.

6. Specification Required:
   Expert review, significant, stable public documentation.

7. RFC Required:
   Any RFC publication, IETF or a non-IETF Stream.

8. IETF Review:
   RFC publication, IETF Stream only, but need not be Standards Track.

9. Standards Action:
   RFC publication, IETF Stream, Standards Track only.

In considering which of those policies to apply, it's important to get the right balance of review and ease of registration. In many cases, those needing to register items will not be IETF participants; requests often come from other standards organizations, from organizations not directly involved in standards, from ad-hoc community work (from an open-source project, for example), and so on. We must not make registration policies and procedures unnecessarily difficult to navigate, unnecessarily costly (in terms of time and other resources), nor unnecessarily subject to denial.

While it is sometimes necessary to restrict what gets registered (for limited resources such as bits in a byte or numbers within a relatively small range, or for items for which unsupported values can be damaging to protocol operation), in many cases having items registered is more important than putting restrictions on the registration. A pattern of denial through overly strict review criteria, or because of excessive cost in time and effort to get through the process, discourages people from even attempting to register their items. And failure to have in-use items registered adversely affects the protocols in use on the Internet.

In particular, because policies 7 through 9 require involvement of working groups, directorates, and/or communities of former working-group participants to be actively involved and to support the effort, requests frequently run into concerns that "it's not worth doing a Standards-Track RFC for something this trivial," when, in fact, that requirement was created by the working group in the first place, with its selection of a Standards Action policy for the registry. Indeed, publishing any RFC is costly, and a Standards Track RFC is especially so, requiring a great deal of community time for review and discussion, IETF-wide last call, involvement of the entire IESG as well as concentrated time and review from the sponsoring AD, review and action by IANA, and RFC-Editor processing.

Working groups and other document developers should use care in selecting appropriate registration policies when their documents create registries. They should select the least strict policy that suits a registry's needs, and look for specific justification for policies stricter than Specification Required. Examples of situations that might merit RFC Required, IETF Review, or Standards Action include the following.

- Registries of limited resources, such as bits in a byte (or in two bytes, or four), or numbers in a limited range. In these cases, allowing registrations that haven't been carefully reviewed and agreed by community consensus could too quickly deplete the allowable values.

- Registries for which thorough community review is necessary to avoid extending or modifying the protocol in ways that could be damaging. One example is in defining new command codes, as opposed to options that use existing command codes: the former might require a strict policy, where a more relaxed policy could be adequate for the latter. Another example is in defining things that change the semantics of existing operations.

There will be other cases, as well, of course; much assessment and judgment is needed. It's not the intent here to put limits on the

applicability of particular registration policies, but to recommend laxity, rather than strictness, in general, and to encourage document developers to think carefully about each registry before deciding on policies.

The description in Section 4.1.10 of "IESG Approval" suggests that the IESG "can (and should) reject a request if another path for registration is available that is more appropriate and there is no compelling reason not to use that path." The IESG should give similar consideration to any registration policy more stringent than Specification Required, asking for justification and ensuring that more relaxed policies have been considered, and the strict policy is the right one. This is a situation that will -- and should -- involve a substantive discussion between the IESG and the working group, chairs, document editors, and/or document shepherd. The important point, again, is not to relax the registration policy just to get the document through quickly, but to carefully choose the right policy for each registry.

Accordingly, document developers need to anticipate this and document their considerations for selecting the specified policy. Ideally, they should include that in the document. At the least, it should be included in the shepherd writeup for the document, and in any case the document shepherd should ensure that the selected policies have been justified before sending the document to the IESG.

When specifications are revised, registration policies should be reviewed in light of experience since the policies were set. It is also possible to produce a small document at any time, which "updates" the original specification and changes registration policies. In either case, a policy can be relaxed or made more strict, as appropriate to the actual situation.

Once again, it cannot be stressed enough that this must not be a mechanical process, but one to which the document developers apply thought, consideration, assessment, and judgment in choosing the right policy for each registry.

The recommendations in this section apply whether the well-defined policy names defined herein are used, or whether the document contains other policy definitions. The point, again, is not to limit registration policies, but to ensure that the policies selected are appropriate, and that proper consideration has been given to the level of strictness required by them.

4.3. What to Put in Documents That Create a Registry

The previous sections presented some issues that should be considered in formulating a policy for assigning values in namespaces. It is the working group and/or document author's job to formulate an appropriate policy and specify it in the appropriate document. In almost all cases, having an explicit "IANA Considerations" section is appropriate. The following and later sections define what is needed for the different types of IANA actions.

Documents that create a new namespace (or modify the definition of an existing space) and that expect IANA to play a role in maintaining that space (serving as a repository for registered values) MUST provide clear instructions on details of the namespace. In particular, instructions MUST include:

1. The name of the registry (or sub-registry) being created and/or maintained.
   The name will appear on the IANA web page and will be referred to in future documents that need to allocate a value from the new space. The full name (and abbreviation, if appropriate) should be provided. It is highly desirable that the chosen name not be easily confusable with the name of another registry. When creating a sub-registry, the registry that it is a part of must be clearly identified using its exact name (look it up, to be sure). Providing a URL to precisely identify the registry is helpful. Such URLs will be removed from the RFC prior to final publication, but help to ensure that IANA will understand exactly what is being requested. For example, a document could contain something like this:

   > [TO BE REMOVED: This registration should be made in the Foobar Operational Parameters registry, located at http://www.iana.org/assignments/foobar-registry]

2. What information must be provided as part of a request in order to assign a new value. This information may include the need to document relevant security considerations, if any.

3. The review process that will apply to all future requests for a value from the namespace.

   Note: When a designated expert is used, documents MUST NOT name the designated expert in the document itself; instead, any suggested names should be relayed to the appropriate Area Director at the time the document is sent to the IESG for approval. This is usually done in the document shepherd writeup.

If the request should also be reviewed on a specific public mailing list (such as the media-types@iana.org for media types), that mailing address should be specified. Note, however, that when mailing lists are specified, the requirement for a designated expert MUST also be specified (see Section 3).

If IANA is expected to make assignments without requiring an outside review, sufficient guidance MUST be provided so that the requests can be evaluated with minimal subjectivity.

4. The size, format, and syntax of registry entries. When creating a new name/number space, authors must describe any technical requirements on registry (and sub-registry) values (valid ranges for integers, length limitations on strings, etc.) as well as the exact format in which registry values should be displayed. For number assignments, one should specify whether values are to be recorded in decimal, hexadecimal, or some other format. For strings, the encoding format should be specified (ASCII, UTF8, etc.). Authors should also clearly specify what fields to record in the registry.

5. Initial assignments and reservations. Clear instructions should be provided to identify any initial assignments or registrations. In addition, any ranges that are to be reserved for "Private Use", "Reserved", "Unassigned", etc. should be clearly indicated.

When specifying the process for making future assignments, it is quite acceptable to pick one (or more) of the example policies listed in Section 4.1 and refer to it by name. Indeed, this is the preferred mechanism in those cases where the sample policies provide the desired level of review. It is also acceptable to cite one of the above policies and include additional guidelines for what kind of considerations should be taken into account by the review process. For example, RADIUS [RFC3575] specifies the use of a Designated Expert, but includes specific additional criteria the Designated Expert should follow.

For example, a document could say something like this:

This document defines a new DHCP option, entitled "FooBar" (see Section y), assigned a value of TBD1 from the DHCP Option space [to be removed upon publication: http://www.iana.org/assignments/bootp-dhcp-parameters] [RFC2132] [RFC2939]:

Tag	Name	Data Length	Meaning
TBD1	FooBar	N	FooBar server

The FooBar option also defines an 8-bit FooType field, for which IANA is to create and maintain a new sub-registry entitled "FooType values" under the FooBar option. Initial values for the DHCP FooBar FooType registry are given below; future assignments are to be made through Expert Review [BCP26]. Assignments consist of a DHCP FooBar FooType name and its associated value.

Value	DHCP FooBar FooType Name	Definition
0	Reserved	
1	Frobnitz	See Section y.1
2	NitzFrob	See Section y.2
3-254	Unassigned	
255	Reserved	

For examples of documents that provide detailed guidance to IANA on the issue of assigning numbers, consult [RFC6195], [RFC3575], [RFC3968], and [RFC4520].

4.4. Updating IANA Guidelines for Existing Registries

Updating the registration process for an already existing (previously created) namespace (whether created explicitly or implicitly) follows a process similar to that used when creating a new namespace. That is, a document is produced that makes reference to the existing namespace and then provides detailed guidelines for handling assignments in each individual namespace. Such documents are normally processed as Best Current Practices (BCPs) [RFC2026].

Example documents that updated the guidelines for managing (then) pre-existing registries include: [RFC6195], [RFC3228], and [RFC3575].

5. Registering New Values in an Existing Registry

5.1. What to Put in Documents When Registering Values

Often, documents request an assignment from an already existing namespace (one created by a previously published document). In such cases:

- Documents should clearly identify the namespace in which each value is to be registered. If the registration goes into a sub-registry, the author should clearly describe where the assignment or registration should go. It is helpful to use the *exact* namespace name as listed on the IANA web page (please look it up, and don't guess), and cite the RFC where the namespace is defined.

  Note 1: There is no need to mention what the assignment policy for new assignments is, as that should be clear from the references.

  Note 2: When referring to an existing registry, providing a URL to precisely identify the registry is helpful. Such URLs, however, should usually be removed from the RFC prior to final publication, since IANA URLs are not guaranteed to be stable in the future. In cases where it is important to include a URL in the document, IANA should concur on its inclusion.

  For example, a document could contain something like this:

  > [TO BE REMOVED: This registration should be made in the Foobar Operational Parameters registry, located at http://www.iana.org/assignments/foobar-registry]

- Each value requested should be given a unique reference. When the value is numeric, use the notation: TBD1, TBD2, etc. Throughout the document where an actual IANA-assigned value should be filled in, use the "TBDx" notation. This helps ensure that the final RFC has the correct assigned values inserted in all of the relevant places where the value is expected to appear in the final document. For values that are text strings, a specific name can be suggested. IANA will normally assign the name, unless it conflicts with a name already in use.

- Normally, the values to be used are chosen by IANA and documents should specify values of "TBD". However, in some cases, a value may have been used for testing or in early implementations. In such cases, it is acceptable to include text suggesting what specific value should be used (together with the reason for the choice). For example, one might include the text "the value XXX is suggested as it is used in implementations". However, it

should be noted that suggested values are just that; IANA will attempt to assign them, but may find that impossible, if the proposed number has already been assigned for some other use. For some registries, IANA has a long-standing policy prohibiting assignment of names or codes on a vanity or organization-name basis. For example, codes are always assigned sequentially unless there is a strong reason for making an exception. Nothing in this document is intended to change those policies or prevent their future application.

- The IANA Considerations section should summarize all of the IANA actions, with pointers to the relevant sections elsewhere in the document as appropriate. When multiple values are requested, it is generally helpful to include a summary table. It is also helpful for this table to be in the same format as it appears or will appear on the IANA web site. For example:

Value	Description	Reference
TBD1	Foobar	[[this RFC]]

Note: In cases where authors feel that including the full table is too verbose or repetitive, authors should still include the table in the draft, but may include a note asking that the table be removed prior to publication of the final RFC.

As an example, the following text could be used to request assignment of a DHCPv6 option number:

> IANA has assigned an option code value of TBD1 to the DNS Recursive Name Server option and an option code value of TBD2 to the Domain Search List option from the DHCP option code space defined in Section 24.3 of RFC 3315.

5.2. Updating Registrations

Registrations are a request to assign a new value, including the related information needed to evaluate and document the request. Even after a number has been assigned, some types of registrations contain additional information that may need to be updated over time. For example, MIME media types, character sets, and language tags, etc. typically include more information than just the registered value itself. Example information can include point-of-contact information, security issues, pointers to updates, literature references, etc. In such cases, the document defining the namespace must clearly state who is responsible for maintaining and updating a

registration. In different cases, it may be appropriate to specify one or more of the following:

- Let the author update the registration, subject to the same constraints and review as with new registrations.

- Allow some mechanism to attach comments to the registration, for cases where others have significant objections to claims in a registration, but the author does not agree to change the registration.

- Designate the IESG, a designated expert, or another entity as having the right to change the registrant associated with a registration and any requirements or conditions on doing so. This is mainly to get around the problem when a registrant cannot be reached in order to make necessary updates.

5.3. Overriding Registration Procedures

Since RFC 2434 was published, experience has shown that the documented IANA considerations for individual protocols do not always adequately cover the reality after the protocol is deployed. For example, many older routing protocols do not have documented, detailed IANA considerations. In addition, documented IANA considerations are sometimes found to be too stringent to allow even working group documents (for which there is strong consensus) to obtain code points from IANA in advance of actual RFC publication. In other cases, the documented procedures are unclear or neglected to cover all the cases. In order to allow assignments in individual cases where there is strong IETF consensus that an allocation should go forward, but the documented procedures do not support such an assignment, the IESG is granted authority to approve assignments in such cases. The intention is not to overrule properly documented procedures, or to obviate the need for protocols to properly document their IANA considerations. Instead, the intention is to permit assignments in individual cases where it is obvious that the assignment should just be made, but updating the IANA process just to assign a particular code point is viewed as too heavy a burden.

In general, the IETF would like to see deficient IANA registration procedures for a namespace revised through the IETF standards process, but not at the cost of unreasonable delay for needed assignments. If the IESG has had to take the action in this section, it is a strong indicator that the IANA registration procedures should be updated, possibly in parallel with ongoing protocol work.

6. Documentation References in IANA Registries

Usually, registries and registry entries include references to documentation (RFCs or other documents). The purpose of these references is to provide pointers for implementors to find details necessary for implementation, NOT to simply note what document created the registry or entry. Therefore:

- If a document registers an item that is defined and explained elsewhere, the registered reference should be to that document, and not to the document that is merely performing the registration.

- If the registered item is defined and explained in the current document, it is important to include sufficient information to enable implementors to understand the item and to create a proper implementation.

- If the registered item is explained primarily in a specific section of the reference document, it is useful to include a section reference. For example, "[RFC9876], Section 3.2", rather than just "[RFC9876]".

- For documentation of a new registry, the reference should provide information about the registry itself, not just a pointer to the creation of it. Useful information includes the purpose of the registry, a rationale for its creation, documentation of the process and policy for new registrations, guidelines for new registrants or designated experts, and other such related information.

7. What to Do in "bis" Documents

We often produce a new edition of an RFC, which obsoletes the previous edition (we sometimes call these "bis" documents, such as when RFC 9876 is updated by draft-ietf-foo-rfc9876bis). When the original document created registries and/or registered entries, there is a question of how to handle the IANA Considerations section in the "bis" document.

If the registrations specify the original document as a reference, those registrations should be updated to point to the current (not obsolete) documentation for those items. Usually, that will mean changing the reference to be the "bis" document.

For example, suppose RFC 9876 registered the "BANANA" flag in the "Fruit Access Flags" registry, and the documentation for that flag is

in Section 3.2. The current registry might look, in part, like this:

Name	Description	Reference
BANANA	Flag for bananas	[RFC9876], Section 3.2

If draft-ietf-foo-rfc9876bis obsoletes RFC 9876 and, because of some rearrangement, now documents the flag in Section 4.1.2, the IANA Considerations of the bis document might contain text such as this:

> IANA is asked to change the registration information for the BANANA flag in the "Fruit Access Flags" registry to the following:
>
> | Name | Description | Reference |
> |---|---|---|
> | BANANA | Flag for bananas | [[this RFC]], Section 4.2.1 |

In many cases, if there are a number of registered references to the original RFC and the document organization has not changed the registered section numbering much, it may simply be reasonable to do this:

> Because this document obsoletes RFC 9876, IANA is asked to change all registration information that references [RFC9876] to instead reference [[this RFC]].

If information for registered items has been or is being moved to other documents, then, of course, the registration information should be changed to point to those other documents. In no case is it reasonable to leave documentation pointers to the obsoleted document for any registries or registered items that are still in current use.

8. Miscellaneous Issues

8.1. When There Are No IANA Actions

Before an Internet-Draft can be published as an RFC, IANA needs to know what actions (if any) it needs to perform. Experience has shown that it is not always immediately obvious whether a document has no IANA actions, without reviewing the document in some detail. In order to make it clear to IANA that it has no actions to perform (and that the author has consciously made such a determination), such documents should include an IANA Considerations section that states:

> This document has no IANA actions.

This statement, or an equivalent, must only be inserted after the working group or individual submitter has carefully verified it to be true. Using such wording as a matter of "boilerplate" or without careful consideration can lead to incomplete or incorrect IANA actions being performed.

If a specification makes use of values from a namespace that is not managed by IANA, it may be useful to note this fact, with wording such as this:

> The values of the Foobar parameter are assigned by the Barfoo registry on behalf of the Rabfoo Forum. Therefore, this document has no IANA actions.

In some cases, the absence of IANA-assigned values may be considered valuable information for future readers; in other cases, it may be considered of no value once the document has been approved, and may be removed before archival publication. This choice should be made clear in the draft, for example, by including a sentence such as

> [RFC Editor: please remove this section prior to publication.]

or

> [RFC Editor: please do not remove this section.]

8.2. Namespaces Lacking Documented Guidance

For all existing RFCs that either explicitly or implicitly rely on IANA to evaluate assignments without specifying a precise evaluation policy, IANA (in consultation with the IESG) will continue to decide what policy is appropriate. Changes to existing policies can always be initiated through the normal IETF consensus process.

All future RFCs that either explicitly or implicitly rely on IANA to register or otherwise manage namespace assignments MUST provide guidelines for managing the namespace.

8.3. After-the-Fact Registrations

Occasionally, IANA becomes aware that an unassigned value from a managed namespace is in use on the Internet or that an assigned value is being used for a different purpose than originally registered. IANA will not condone such misuse; procedures of the type described in this document MUST be applied to such cases. In the absence of specifications to the contrary, values may only be reassigned for a different purpose with the consent of the original assignee (when possible) and with due consideration of the impact of such a

reassignment. In cases of likely controversy, consultation with the IESG is advised.

8.4. Reclaiming Assigned Values

Reclaiming previously assigned values for reuse is tricky, because doing so can lead to interoperability problems with deployed systems still using the assigned values. Moreover, it can be extremely difficult to determine the extent of deployment of systems making use of a particular value. However, in cases where the namespace is running out of unassigned values and additional ones are needed, it may be desirable to attempt to reclaim unused values. When reclaiming unused values, the following (at a minimum) should be considered:

- Attempts should be made to contact the original party to which a value is assigned, to determine if the value was ever used, and if so, the extent of deployment. (In some cases, products were never shipped or have long ceased being used. In other cases, it may be known that a value was never actually used at all.)

- Reassignments should not normally be made without the concurrence of the original requester. Reclamation under such conditions should only take place where there is strong evidence that a value is not widely used, and the need to reclaim the value outweighs the cost of a hostile reclamation. In any case, IESG Approval is needed in this case.

- It may be appropriate to write up the proposed action and solicit comments from relevant user communities. In some cases, it may be appropriate to write an RFC that goes through a formal IETF process (including IETF Last Call) as was done when DHCP reclaimed some of its "Private Use" options [RFC3942].

8.5. Contact Person vs Assignee or Owner

Many registries include designation of a technical or administrative contact associated with each entry. Often, this is recorded as contact information for an individual. It is unclear, though, what role the individual has with respect to the registration: is this item registered on behalf of the individual, the company the individual worked for, or perhaps another organization the individual was acting for?

This matters because some time later, when the individual has changed jobs or roles, and perhaps can no longer be contacted, someone might want to update the registration. IANA has no way to know what company, organization, or individual should be allowed to take the

registration over. For registrations rooted in RFCs, the stream owner (such as the IESG or the IAB) can make an overriding decision. But in other cases, there is no recourse.

Registries can include, in addition to a "Contact" field, an "Assignee" or "Owner" field that can be used to address this situation, giving IANA clear guidance as to the actual owner of the registration. Alternatively, organizations can put an organizational role into the "Contact" field in order to make their ownership clear.

8.6. BCP 78/79 Issues in Registries

[[anchor2: This section needs to be resolved before publication.]]

9. Appeals

Appeals of registration decisions made by IANA can be made using the normal IETF appeals process as described in Section 6.5 of [RFC2026]. Specifically, appeals should be directed to the IESG, followed (if necessary) by an appeal to the IAB, etc.

10. Mailing Lists

All IETF mailing lists associated with evaluating or discussing assignment requests as described in this document are subject to whatever rules of conduct and methods of list management are currently defined by Best Current Practices or by IESG decision.

11. Security Considerations

Information that creates or updates a registration needs to be authenticated and authorized. IANA updates registries according to instructions in published RFCs and from the IESG. It also may accept clarifications from document authors, relevant working group chairs, Designated Experts, and mail list participants, too.

Information concerning possible security vulnerabilities of a protocol may change over time. Likewise, security vulnerabilities related to how an assigned number is used may change as well. As new vulnerabilities are discovered, information about such vulnerabilities may need to be attached to existing registrations, so that users are not misled as to the true security issues surrounding the use of a registered number.

An analysis of security issues is generally required for all

protocols that make use of parameters (data types, operation codes, keywords, etc.) used in IETF protocols or registered by IANA. Such security considerations are usually included in the protocol document [RFC3552]. It is the responsibility of the IANA considerations associated with a particular registry to specify what (if any) security considerations must be provided when assigning new values, and the process for reviewing such claims.

12. Changes Relative to Earlier Editions of BCP 26

12.1. 2012: Changes in This Document Relative to RFC 5226

Significant additions:

- Added Section 3.4, Expert Reviews and the Document Lifecycle
- Moved well-known policies into a separate section for each, subsections of Section 4.1.
- Added Section 4.2, Best Practice for Selecting an Appropriate Policy.
- Added Section 6, Documentation References in IANA Registries
- Added Section 7, What to Do in "bis" Documents
- Added Section 8.5, Contact Person vs Assignee or Owner
- Added Section 8.6, BCP 78/79 Issues in Registries

Clarifications and such:

- Made clarifications about identification of IANA registries and use of URLs for them.
- Clarified the distinction between "Unassigned" and "Reserved".
- Made some clarifications in "Expert Review" about instructions to the designated expert.
- Made some clarifications in "Specification Required" about how to declare this policy.
- Assorted minor clarifications and editorial changes throughout.

12.2. 2008: Changes in RFC 5226 Relative to RFC 2434

Changes include:

- Major reordering of text to expand descriptions and to better group topics such as "updating registries" vs. "creating new registries", in order to make it easier for authors to find the text most applicable to their needs.

- Numerous editorial changes to improve readability.

- Changed the term "IETF Consensus" to "IETF Review" and added more clarifications. History has shown that people see the words "IETF Consensus" (without consulting the actual definition) and are quick to make incorrect assumptions about what the term means in the context of IANA Considerations.

- Added "RFC Required" to list of defined policies.

- Much more explicit directions and examples of "what to put in RFCs".

- "Specification Required" now implies use of a Designated Expert to evaluate specs for sufficient clarity.

- Significantly changed the wording in the Designated Experts section. Main purpose is to make clear that Expert Reviewers are accountable to the community, and to provide some guidance for review criteria in the default case.

- Changed wording to remove any special appeals path. The normal RFC 2026 appeals path is used.

- Added a section about reclaiming unused value.

- Added a section on after-the-fact registrations.

- Added a section indicating that mailing lists used to evaluate possible assignments (such as by a Designated Expert) are subject to normal IETF rules.

13. Acknowledgments

13.1. Acknowledgments for This Document (2012)

Thomas Narten and Harald Tveit Alvestrand edited the two earlier editions of this document (RFCs 2434 and 5226), and Thomas continues

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13.2. Acknowledgments from the second edition (2008)

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