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Assigning Experimental and Testing Numbers Considered Useful

Status of this Memo

This document specifies an Internet Best Current Practices for the Internet Community, and requests discussion and suggestions for improvements. Distribution of this memo is unlimited.

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Abstract

When experimenting with or extending protocols, it is often necessary to use some sort of protocol number or constant in order to actually test or experiment with the new function, even when testing in a closed environment. For example, to test a new DHCP option, one needs an option number to identify the new function. This document recommends that when writing IANA Considerations sections, authors should consider assigning a small range of numbers for experimentation purposes that implementers can use when testing protocol extensions or other new features. This document reserves some ranges of numbers for experimentation purposes in specific protocols where the need to support experimentation has been identified.

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1. Introduction

When experimenting with or extending protocols, it is often necessary to have a protocol number as part of the implementation [RFC2434]. For example, to develop a protocol that runs directly above IP, one needs an IP Protocol Number to place in the Protocol field of the IP header [RFC791]. In some cases, obtaining a new number is straightforward (e.g., a well-known TCP or UDP port) or not even necessary (e.g., TCP and UDP port numbers for testing purposes). In other cases, obtaining a number is more difficult. For example, the number of available and unassigned values in a name space may be small enough that there is concern that all available numbers will be used up if assigned carelessly. Even in cases where numbers are potentially plentiful, it may be undesirable to assign numbers unless the proposed usage has been adequately reviewed by the broader community. Consequently, some number spaces specify that IANA only make assignments in cases where there is strong community support for a proposed protocol. For example, values out of some name spaces are only assigned through an "IETF Standards Action" [RFC2434], which requires that the proposed use be in an IETF Standards Track RFC.

In order to experiment with a new protocol, an experimental value may be needed that won't collide with an existing or future usage.

One approach is to allow IANA to make temporary assignments for such purposes. The idea is that a protocol value can be assigned to allow experimentation, but after the experiment ends, the number would be returned to IANA. There are several drawbacks to this approach, however. First, experience has shown that it can be difficult to reclaim numbers once assigned. For example, contact information becomes outdated and it can become difficult to find out what the status of an experiment actually is. Second, should deployment with the temporarily assigned number take place (e.g., it is included as part of a product), it becomes very difficult to determine whether or not reuse of that number would lead to adverse impact with regards to deployed devices. Finally, it can be difficult to determine when an experiment has ended and whether the number needs to be returned.

An alternate approach, and the one recommended in this document, is to assign a range of numbers specifically earmarked for testing and experimentation purposes. Mutually consenting devices could use these numbers for whatever purposes they desire, but under the understanding that they are reserved for generic testing purposes, and other implementations may use the same numbers for different experimental uses.

Numbers in the experimentation range are similar to those called "Private Use" in RFC 2434 [IANA-CONSIDERATIONS]. They are not intended to be used in general deployments or be enabled by default in products or other general releases. In those cases where a product or release makes use of an experimental number, the end user must be required to explicitly enable the experimental feature and likewise have the ability to chose and assign which number from the experimental range will be used for a specific purpose (i.e., so the end user can ensure that use of a particular number doesn't conflict with other on-going uses). Shipping a product with a specific value pre-enabled would be inappropriate and can lead to interoperability problems when the chosen value collides with a different usage, as it someday surely will.

From the above, it follows that it would be inappropriate for a group of vendors, a consortia, or another Standards Development Organization to agree among themselves to use a particular value for a specific purpose and then agree to deploy devices using those values. By definition, experimental numbers are not guaranteed to be unique in any environment other than one where the local system administrator has chosen to use a particular number for a particular purpose and can ensure that a particular value is not already in use for some other purpose.

Once an extension has been tested and shown to be useful, a permanent number could be obtained through the normal assignment procedures.

Most implementations will not do anything special with numbers assigned for testing purposes. In particular, unless a packet or other Protocol Data Unit (PDU) is specifically directed at a device, that device will not even look at the field while processing the PDU. For example, IP routers do not need to examine or understand the Protocol Type field of IP datagrams in order to know how to correctly forward them. In those cases where a packet or PDU is directed at a device, and that device has not been configured to recognize the extension, the device will either ignore the PDU, discard it, or signal an error, depending on the protocol-specific rules that indicate how to process unknown options or features. In those cases where a protocol has different ways of handling unrecognized extensions (e.g., silently discard vs. signal an error), that protocol needs to reserve values for testing purposes from all the appropriate ranges. Only those implementations specifically enabled or configured to make use of an extension or feature that is being experimented with would process the data further.

1.1. Recommendation for Protocols

To make it possible to experiment with protocol extensions safely, protocol documents should consider reserving a small set of protocol numbers for experimentation. Such reservations can be made through an explicit reservation in an IANA Considerations section.

The exact number of values to reserve for experimentation will depend on the specific protocol and factors specific to that protocol. For example, in cases where the values of a field are subdivided into ranges that are treated differently (e.g., "silently ignore" vs. "return an error" if the value is not understood), one or more values from each sub-range may need to be reserved.

For protocols that return error codes, it may also be appropriate to reserve a small number of experimental error values that can be used in conjunction with possible experimental uses. For example, an experimental message might result (even under normal conditions) in an error, with a special error code (or sub-code) indicating the type of error condition.

In many, if not most cases, reserving a single value for experimental use will suffice. While it may be tempting to reserve more in order to make it easy to test many things at once, reserving many may also increase the temptation for someone using a particular value to assume that a specific experimental value can be used for a given purpose exclusively. Values reserved for experimental use are never to be made permanent; permanent assignments should be obtained through standard processes. As described above, experimental numbers are intended for experimentation and testing and are not intended for wide or general deployments.

When protocols that use experimental numbers are included in products, the shipping versions of the products must disable recognition of protocol experimental numbers by default -- that is, the end user of the product must explicitly "turn on" the experimental protocol functionality. In most cases, a product implementation must require the end user to configure the value explicitly prior to enabling its usage. Should a product not have a user interface for such end user configuration, the product must require explicit re-programming (e.g., a special firmware download, or installation of a feature card) to configure the experimental number(s) of the protocol(s) implicitly.

2. IANA Considerations

2.1. IP Protocol Field

Assignment of new values for the IP Protocol field requires an IETF Standards Action per [RFC2780]. For the purposes of experimentation and testing, IANA has assigned the two values 253 and 254 for this purpose. These values have been allocated from the upper end of the available number space in order to make them easy to identify by having them stand out relative to the existing assignments that have been made.

2.2. Existing Name Spaces

Numerous name spaces exist for which no values have been reserved for experimentation or testing purpose. Experimental values for such protocols can of course be assigned through the normal process of publishing an RFC that documents the details of such an allocation. To simplify the process in those cases where the publication of a documentation just for the purpose of assigning an experimental allocation seems overkill, experimental values can be made through IESG Approval [RFC2434].

3. Security Considerations

This document has no known security implications.

4. Acknowledgments

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5. References

5.1. Normative References

[RFC2780] Bradner, S. and V. Paxson, "IANA Allocation Guidelines For Values In the Internet Protocol and Related Headers", BCP 37, RFC 2780, March 2000.

[RFC2434] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 2434, October 1998.

5.2. Informative References

[RFC791] Postel, J., "Internet Protocol", STD 5, RFC 791, September 1981.

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