RFC 9748
Updating the NTP Registries

Abstract

The Network Time Protocol (NTP) and Network Time Security (NTS) documents define a number of registries, collectively called the NTP registries.

Some registries are correct, but some include incorrect assignments and some don't follow common practice. For the sake of completeness, this document reviews all NTP and NTS registries, and corrects the registries where necessary.

This document updates RFCs 5905, 5906, 7821, 7822, and 8573.

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/rfc9748.

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1. Introduction

The Network Time Protocol (NTP) and Network Time Security (NTS) documents define a number of registries, collectively called the NTP registries. The NTP registries can all be found at <https://www.iana.org/assignments/ntp-parameters> and the NTS registries can all be found at <https://www.iana.org/assignments/nts>.

Some registries are correct, but some include incorrect assignments and some don't follow common practice. For the sake of completeness, this document reviews all NTP and NTS registries, and corrects the registries where necessary.

The bulk of this document can be divided into two parts:

- a summary of the relevant registries, including syntax requirements, registration procedures, and the defining documents.
- a revised format and entries for each registry being modified.

2. Existing Registries

This section describes the registries and the rules for them. It is intended to be a short summary of the syntax and registration requirements for each registry. The semantics and protocol processing rules for each registry -- that is, how an implementation acts when sending or receiving any of the fields -- are not described here.

2.1. Reference ID and Kiss-o'-Death Registries

[RFC5905] defines two registries: "NTP Reference Identifier Codes" in Section 7.3 and the "NTP Kiss-o'-Death Codes" in Section 7.4. Reference identifiers and kiss codes can be up to four ASCII characters, padded on the right with all-bits-zero if necessary. Entries that start with 0x58, the ASCII letter uppercase X, are reserved for Private or Experimental Use. Both registries are First Come First Served. The registries were created per Section 16 of [RFC5905].

2.2. Extension Field Types

Section 7.5 of [RFC5905] defines the on-the-wire format of extension fields but does not create a registry for them.

Section 13 of [RFC5906] mentions the "NTP Extension Field Types" registry, and defines it indirectly by defining 30 extensions (10 each for request, response, and error response). It does not provide a formal definition of the columns in the registry. Section 10 of [RFC5906] splits the Field Type into four subfields, only for use within the Autokey extensions.

[RFC7821] adds a new entry, Checksum Complement, to the "NTP Extension Field Types" registry.

[RFC7822] clarifies the processing rules for Extension Field Types, particularly around the interaction with the Message Authentication Code (MAC) field. NTPv4 packets may contain a MAC that appears where one would expect the next extension field header.

[RFC8573] changes the cryptography used in the MAC field.

[RFC8915] adds four new entries to the "NTP Extension Field Types" registry.

The following problems exist with the current registry:

- Many of the entries in the "NTP Extension Field Types" registry have swapped some of the nibbles; for example, 0x0302 was listed for Cookie Message Request instead of 0x0203. The errors are due to documentation errors with the original implementation of Autokey. This document marks the erroneous values as reserved, in case there is an implementation using the registered values instead of what the original implementation used. Applications that

used those values would have realized that they did not interoperate with the dominant (if not only) implementation at the time. Marking the values as reserved ensures that any such applications continue to work as is.

- Some values were mistakenly reused.

2.3. Network Time Security Registries

[RFC8915] defines the NTS protocol. The related registries are listed here for completeness, but there are no changes specified in this document.

In [RFC8915]:

Sections 7.1 through 7.5 (inclusive) added entries to existing registries.

Section 7.6 created the "Network Time Security Key Establishment Record Types" registry that partitions the range into three different registration policies: IETF Review, Specification Required, and Private or Experimental Use.

Section 7.7 created the "Network Time Security Next Protocols" registry that similarly partitions the range.

Section 7.8 created the "Network Time Security Error Codes" and "Network Time Security Warning Codes" registries. Both registries are partitioned the same way.

3. Registry Updates

The following general guidelines apply to the NTP registries:

- Each registry reserves a partition for Private or Experimental Use.
- Entries with ASCII fields are now limited to uppercase letters or digits; fields starting with 0x58, the uppercase letter "X", are reserved for Private or Experimental Use.
- The policy for every registry is now Specification Required, as defined in [RFC8126], Section 4.6.

The IESG is requested to choose three designated experts (DEs), with approvals from two being required to implement a change. Guidance for the experts is given below.

3.1. Guidance to Designated Experts

The DEs should be familiar with [RFC8126], particularly Section 5. As that reference suggests, the DE should ascertain the existence of a suitable specification and verify that it is publicly available. The DE is also expected to check the clarity of purpose and use of the requested code points.

In addition, the DE is expected to be familiar with this document, specifically the history documented here.

4. IANA Considerations

Each entry described in the subsections below is intended to completely replace the existing entry with the same name.

4.1. NTP Reference Identifier Codes

The registration procedure has been changed to Specification Required and this document has been added as a reference.

The Note has been changed to read as follows:

> Codes beginning with the character "X" are reserved for experimentation and development. IANA cannot assign them.

The columns are defined as follows:

ID (required):   a four-byte value padded on the right with all-bits-zero. Each byte other than padding must be ASCII uppercase letters or digits.
Clock source (required):   a brief text description of the ID.
Reference (required):   the publication defining the ID.

The existing entries are left unchanged.

4.2. NTP Kiss-o'-Death Codes

The registration procedure is changed to Specification Required and this document has been added as a reference.

The Note has been changed to read as follows:

> Codes beginning with the character "X" are reserved for experimentation and development. IANA cannot assign them.

The columns are defined as follows:

ID (required):   a four-byte value padded on the right with all-bits-zero. Each byte other than padding must be ASCII uppercase letters or digits.
Meaning source (required):   a brief text description of the ID.
Reference (required):   the publication defining the ID.

The existing entries are left unchanged.

4.3. NTP Extension Field Types

The registration procedure has been changed to Specification Required and [RFC5906] and this document have been added as references.

The following two Notes have been added:

> Field Types in the range 0xF000 through 0xFFFF, inclusive, are reserved for experimentation and development. IANA cannot assign them. Both NTS Cookie and Autokey Message Request have the same Field Type; in practice this is not a problem as the field semantics will be determined by other parts of the message.

> The "Reserved for historic reasons" is for differences between the original documentation and implementation of Autokey and marks the erroneous values as reserved, in case there is an implementation that used the registered values instead of what the original implementation used.

The columns are defined as follows:

Field Type (required):   a two-byte value in hexadecimal.
Meaning (required):   a brief text description of the field type.
Reference (required):   the publication defining the field type.

IANA has updated the registry as shown in Table 1.

Field Type	Meaning	Reference
0x0000	Crypto-NAK; authentication failure	[RFC5905]
0x0002	Reserved for historic reasons	RFC 9748
0x0102	Reserved for historic reasons	RFC 9748
0x0104	Unique Identifier	[RFC8915], Section 5.3
0x0200	No-Operation Request	[RFC5906]
0x0201	Association Message Request	[RFC5906]
0x0202	Certificate Message Request	[RFC5906]
0x0203	Cookie Message Request	[RFC5906]

Field Type	Meaning	Reference
0x0204	Autokey Message Request	[RFC5906]
0x0204	NTS Cookie	[RFC8915], Section 5.4
0x0205	Leapseconds Message Request	[RFC5906]
0x0206	Sign Message Request	[RFC5906]
0x0207	IFF Identity Message Request	[RFC5906]
0x0208	GQ Identity Message Request	[RFC5906]
0x0209	MV Identity Message Request	[RFC5906]
0x0302	Reserved for historic reasons	RFC 9748
0x0304	NTS Cookie Placeholder	[RFC8915], Section 5.5
0x0402	Reserved for historic reasons	RFC 9748
0x0404	NTS Authenticator and Encrypted Extension Fields	[RFC8915], Section 5.6
0x0502	Reserved for historic reasons	RFC 9748
0x0602	Reserved for historic reasons	RFC 9748
0x0702	Reserved for historic reasons	RFC 9748
0x0802	Reserved for historic reasons	RFC 9748
0x0902	Reserved for historic reasons	RFC 9748
0x2005	UDP Checksum Complement	[RFC7821]
0x8002	Reserved for historic reasons	RFC 9748
0x8102	Reserved for historic reasons	RFC 9748
0x8200	No-Operation Response	[RFC5906]
0x8201	Association Message Response	[RFC5906]
0x8202	Certificate Message Response	[RFC5906]

Field Type	Meaning	Reference
0x8203	Cookie Message Response	[RFC5906]
0x8204	Autokey Message Response	[RFC5906]
0x8205	Leapseconds Message Response	[RFC5906]
0x8206	Sign Message Response	[RFC5906]
0x8207	IFF Identity Message Response	[RFC5906]
0x8208	GQ Identity Message Response	[RFC5906]
0x8209	MV Identity Message Response	[RFC5906]
0x8302	Reserved for historic reasons	RFC 9748
0x8402	Reserved for historic reasons	RFC 9748
0x8502	Reserved for historic reasons	RFC 9748
0x8602	Reserved for historic reasons	RFC 9748
0x8702	Reserved for historic reasons	RFC 9748
0x8802	Reserved for historic reasons	RFC 9748
0x8902	Reserved for historic reasons	RFC 9748
0xC002	Reserved for historic reasons	RFC 9748
0xC102	Reserved for historic reasons	RFC 9748
0xC200	No-Operation Error Response	[RFC5906]
0xC201	Association Message Error Response	[RFC5906]
0xC202	Certificate Message Error Response	[RFC5906]
0xC203	Cookie Message Error Response	[RFC5906]
0xC204	Autokey Message Error Response	[RFC5906]
0xC205	Leapseconds Message Error Response	[RFC5906]
0xC206	Sign Message Error Response	[RFC5906]
0xC207	IFF Identity Message Error Response	[RFC5906]

Field Type	Meaning	Reference
0xC208	GQ Identity Message Error Response	[RFC5906]
0xC209	MV Identity Message Error Response	[RFC5906]
0xC302	Reserved for historic reasons	RFC 9748
0xC402	Reserved for historic reasons	RFC 9748
0xC502	Reserved for historic reasons	RFC 9748
0xC602	Reserved for historic reasons	RFC 9748
0xC702	Reserved for historic reasons	RFC 9748
0xC802	Reserved for historic reasons	RFC 9748
0xC902	Reserved for historic reasons	RFC 9748
0xF000-0xFFFF	Reserved for Experimental Use	RFC 9748

Table 1

5. Security Considerations

This document adds no new security considerations, as they are defined in the document that defines the extension. See the References column of the appropriate IANA registry.

6. Normative References

[RFC5905]   Mills, D., Martin, J., Ed., Burbank, J., and W. Kasch, "Network Time Protocol Version 4: Protocol and Algorithms Specification", RFC 5905, DOI 10.17487/RFC5905, June 2010, <https://www.rfc-editor.org/info/rfc5905>.

[RFC5906]   Haberman, B., Ed. and D. Mills, "Network Time Protocol Version 4: Autokey Specification", RFC 5906, DOI 10.17487/RFC5906, June 2010, <https://www.rfc-editor.org/info/rfc5906>.

[RFC7821]   Mizrahi, T., "UDP Checksum Complement in the Network Time Protocol (NTP)", RFC 7821, DOI 10.17487/RFC7821, March 2016, <https://www.rfc-editor.org/info/rfc7821>.

[RFC7822]   Mizrahi, T. and D. Mayer, "Network Time Protocol Version 4 (NTPv4) Extension Fields", RFC 7822, DOI 10.17487/RFC7822, March 2016, <https://www.rfc-editor.org/info/rfc7822>.

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA
           Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June
           2017, <https://www.rfc-editor.org/info/rfc8126>.

[RFC8573] Malhotra, A. and S. Goldberg, "Message Authentication Code for the Network
           Time Protocol", RFC 8573, DOI 10.17487/RFC8573, June 2019, <https://www.rfc-
           editor.org/info/rfc8573>.

[RFC8915] Franke, D., Sibold, D., Teichel, K., Dansarie, M., and R. Sundblad, "Network Time
           Security for the Network Time Protocol", RFC 8915, DOI 10.17487/RFC8915,
           September 2020, <https://www.rfc-editor.org/info/rfc8915>.

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