

Network Working Group	R. Gayraud	
Internet-Draft	B. Lourdelet	
Intended status: Standards Track	Cisco Systems, Inc.	
Expires: November 28, 2008	May 27, 2008	

[TOC](#)

## Network Time Protocol (NTP) Server Option for DHCPv6 draft-ietf-ntp-dhcpv6-ntp-opt-00.txt

### Status of this Memo

By submitting this Internet-Draft, each author represents that any applicable patent or other IPR claims of which he or she is aware have been or will be disclosed, and any of which he or she becomes aware will be disclosed, in accordance with Section 6 of BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/lid-abstracts.txt>.

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>.

This Internet-Draft will expire on November 28, 2008.

### Abstract

The NTP Server Option for DHCPv6 provides NTP (Network Time Protocol version 4) configuration information to DHCPv6 hosts.

---

### Table of Contents

- [1.](#) Requirements notation
- [2.](#) Introduction
  - [2.1.](#) Related Work and Usage Model
- [3.](#) NTP Server Option for DHCPv6
- [4.](#) NTP Server Address Suboption
- [5.](#) NTP Server FQDN Suboption
- [6.](#) Examples of use
- [7.](#) Appearance of this Option
- [8.](#) Security Considerations

## [9.](#) IANA Considerations

## [10.](#) References

### [10.1.](#) Normative References

### [10.2.](#) Informative References

## [§](#) Authors' Addresses

## [§](#) Intellectual Property and Copyright Statements

---

## **1. Requirements notation**

[TOC](#)

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 [\[RFC2119\] \(Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels," March 1997.\)](#).

---

## **2. Introduction**

[TOC](#)

This document defines a DHCPv6 option and associated suboptions to provide Network Time Protocol version 4 [draft-ntp4] or greater configuration information to DHCPv6 hosts.

---

### **2.1. Related Work and Usage Model**

[TOC](#)

[\[RFC4075\] \(Kalusivalingam, V., "Simple Network Time Protocol \(SNTP\) Configuration Option for DHCPv6," May 2005.\)](#) (SNTP Configuration Option for DHCPv6) provides some degree of automatic time server configuration for IPv6, as it specifies how to transmit SNTP [\[RFC4330\] \(Mills, D., "Simple Network Time Protocol \(SNTP\) Version 4 for IPv4, IPv6 and OSI," January 2006.\)](#) servers addresses through DHCPv6. However, this approach is not suitable for all NTP deployments. The use of the SNTP protocol is only authorized at the root and leafs of an NTP tree (i.e. stratum 1 servers and highest stratum clients). But NTP servers that receive time from an upstream source, and redistribute it to LAN workstations, are not allowed to run SNTP. This is why SNTP is not the protocol of choice for general purpose NTP servers directly used by client workstations. Additionally the approach of only offering IPv6 addresses to specify server location does not meet NTP requirements that make use of a FQDN (Fully Qualified Domain Name) as well.

The NTP service is publicly offered on the Internet by a number of organizations. Those servers can be used but not abused, so any method

which is tasked to disseminate locations of NTP servers must act responsibly in a manner that does not lead to public server overloading. When using DHCPv6 to offer NTP server location, and if there is a need to distribute a device with a hardcoded configuration, this configuration MUST NOT include server location that is not part of the organization that distribute this device. Typical usage of this option is to specify an NTP server that is part of the organization that operates the DHCPv6 server.

The location of the NTP service, like any other Internet service, can be specified by an IP address or an FQDN. By design, DHCP offers information to multiple devices and is prone to amplification of mistakes, so great care must be taken to define its configuration. Specification of the NTP service by FQDN offers a level of indirection that works as a possible mitigation tool in case of misconfiguration. DNS can be used to redirect misconfigured clients to an unexisting IPv6 address instead of having to change the address of the NTP Server itself.

While the NTP specification defines a comprehensive set of configuration parameters, modification of those parameters is best left to the decision of the client itself. The DHCPv6 option for NTP is then restricted to server location.

---

### 3. NTP Server Option for DHCPv6

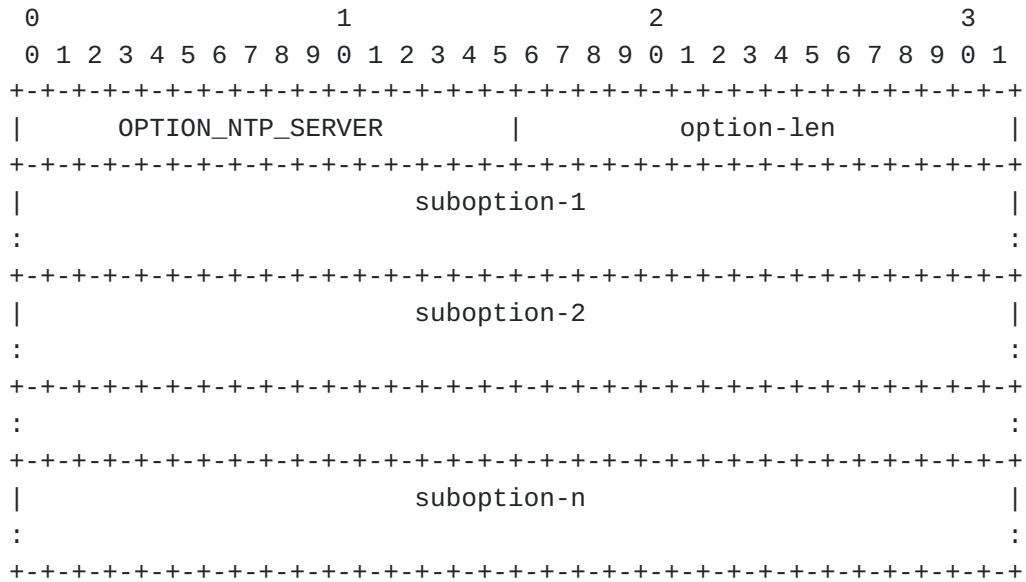
[TOC](#)

This option serves as a container for all the information related to one NTP server. This option can appear multiple times in a DHCPv6 message. Each instance of this option is to be considered by the NTP client as a server to include in its configuration.

The option itself does not contain any value. Instead, it contains one or several suboptions that carry NTP server configuration information. The first suboption in this option MUST be either NTP\_OPTION\_SRV\_ADDR or NTP\_OPTION\_SRV\_FQDN. It carries the NTP server location, as an IPv6 address or as an NTP server FQDN.

If the NTP server location is an IPv6 multicast address, the client SHOULD use this address as an NTP multicast group address and listen to messages sent to this group in order to synchronize its clock.

The format of the NTP Server Option is:



option-code: OPTION\_NTP\_SERVER (TBD\_IANA),

option-len: Total length of the included suboptions.

A client that receives this option SHOULD use the specified NTP server to synchronize its clock.

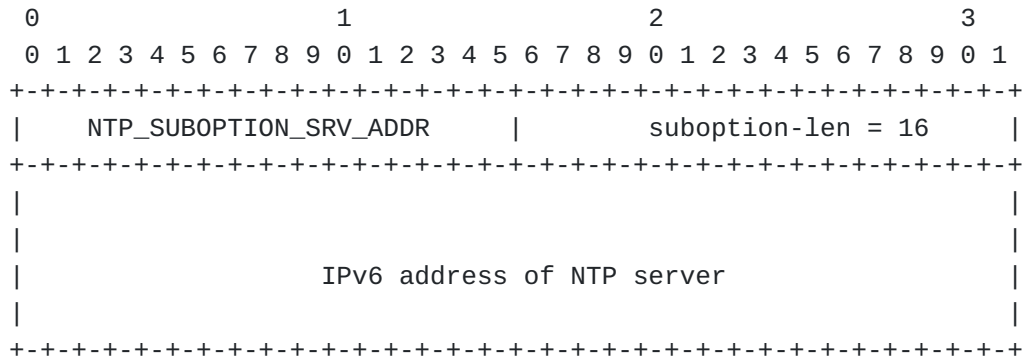
This document does not define any priority between the client's embedded configuration and the NTP servers discovered via this option. In particular, the client is allowed to simultaneously use its own configured NTP servers and the servers discovered via DHCP.

#### 4. NTP Server Address Suboption

[TOC](#)

This suboption is intended to appear inside the OPTION\_NTP\_SERVER option. It specifies the IPv6 address of an NTP server available to the client. An example of use is present in [Section 6 \(Examples of use\)](#). This suboption can also be used to carry the IPv6 multicast group address used by NTP on the local network.

The format of the NTP Server Address Suboption is:



suboption-code: NTP\_SUBOPTION\_SRV\_ADDR (1),

suboption-len: 16.

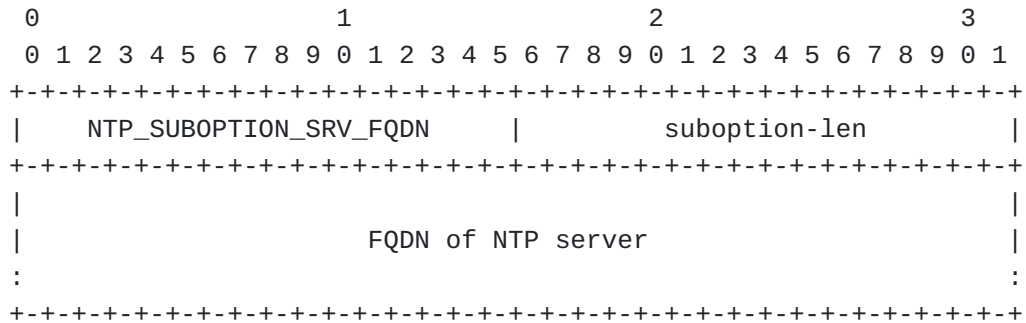
---

## 5. NTP Server FQDN Suboption

[TOC](#)

This suboption is intended to appear inside the OPTION\_NTP\_SERVER option. It specifies the FQDN of an NTP server available to the client.

The format of the NTP Server FQDN Suboption is:



suboption-code: NTP\_SUBOPTION\_SRV\_FQDN (2),

suboption-len: Length of the included FQDN field,

FQDN: Fully Qualified Domain Name of the NTP server. This field MUST be encoded as described in [RFC3315], section 8.

---

## 6. Examples of use

[TOC](#)

To instruct a client to use an NTP server located at address 2001:db8::1, a DHCP server shall use the following format:

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   OPTION_NTP_SERVER   |   option-len = 20   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   NTP_SUBOPTION_SRV_ADDR   |   suboption-len = 16   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               |
|   IPv6 address = 2001:db8::1   |
|                               |
|                               |
|                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

To to enable a client to use the 'ntp.example.com' server, a DHCP server shall use the following format:

```

0                               1                               2                               3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   OPTION_NTP_SERVER   |   option-len = 21   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   NTP_SUBOPTION_SRV_FQDN   |   suboption-len = 17   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   3   |   'n'   |   't'   |   'p'   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   7   |   'e'   |   'x'   |   'a'   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   'm'   |   'p'   |   'l'   |   'e'   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   3   |   'c'   |   'o'   |   'm'   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   0   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

To instruct a client to join the FF05::101 NTP multicast group, a DHCP server shall use the following format:

```

      0               1               2               3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      OPTION_NTP_SERVER      |      option-len = 20      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      NTP_SUBOPTION_SRV_ADDR  |      suboption-len = 16    |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               |                             |
|                               | IPv6 address = FF05::101    |
|                               |                             |
|                               |                             |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

---

## 7. Appearance of this Option

[TOC](#)

The `OPTION_NTP_SERVER` option can appear multiple times in a DHCPv6 message. The order in which these options appear is not significant. The client uses its usual algorithms to determine which server(s) or multicast group(s) should be preferred to synchronize its clock. The `OPTION_NTP_SERVER` option MUST NOT appear in messages other than the following: Solicit, Advertise, Request, Renew, Rebind, Information-Request, and Reply. If this option appears in messages other than those specified above, the receiver SHOULD ignore it.

The option number for this option MAY appear in the "Option Request" option [\[RFC3315\] \(Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 \(DHCPv6\)," July 2003.\)](#) in the following messages: Solicit, Request, Renew, Rebind, Information-Request, and Reconfigure. If this option number appears in the "Option Request" option in messages other than those specified above, the receiver SHOULD ignore it.

---

## 8. Security Considerations

[TOC](#)

This option could be used by an intruder to advertise the address of a malicious NTP server and adversely affect the clock of clients on the network. The consequences of such an attack can be critical, because many security protocols depend on time synchronization to run their algorithms. As an example, an attacker could break connectivity between SEND-enabled nodes [\[RFC3971\] \(Arkko, J., Kempf, J., Zill, B., and P. Nikander, "SEcure Neighbor Discovery \(SEND\)," March 2005.\)](#), simply by affecting the clock on these nodes.

To prevent these attacks, it is strongly advisable to secure the use of this option either by:

- using the NTPv4 Autokey public key authentication, as defined in [draft-autokey] or,
- using authenticated DHCP as described in [RFC3315] section 21.

---

## 9. IANA Considerations

[TOC](#)

When this document is published, the IANA is requested to assign an option code from the "DHCPv6 Options Codes" registry for OPTION\_NTP\_SERVER.

---

## 10. References

[TOC](#)

---

### 10.1. Normative References

[TOC](#)

[RFC3315]	Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, " <a href="#">Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</a> ," RFC 3315, July 2003 ( <a href="#">TXT</a> ).
[draft-ntp4]	Burbank, J., Kasch, W., Martin, J., and D. Mills, " <a href="#">Network Time Protocol Version 4 Protocol And Algorithms Specification</a> ," draft-ietf-ntp-ntp4-08 (work in progress), November 2007.
[draft-autokey]	Haberman, B. and D. Mills, " <a href="#">Network Time Protocol Version 4 Autokey Specification</a> ," draft-ietf-ntp-autokey-00 (work in progress), September 2007.

---

### 10.2. Informative References

[TOC](#)

[RFC2119]	<a href="#">Bradner, S.</a> , " <a href="#">Key words for use in RFCs to Indicate Requirement Levels</a> ," BCP 14, RFC 2119, March 1997 ( <a href="#">TXT</a> , <a href="#">HTML</a> , <a href="#">XML</a> ).
[RFC3971]	Arkko, J., Kempf, J., Zill, B., and P. Nikander, " <a href="#">SEcure Neighbor Discovery (SEND)</a> ," RFC 3971, March 2005 ( <a href="#">TXT</a> ).
[RFC4075]	



	Kalusivalingam, V., " <a href="#">Simple Network Time Protocol (SNTP) Configuration Option for DHCPv6</a> ," RFC 4075, May 2005 ( <a href="#">TXT</a> ).
[RFC4330]	Mills, D., " <a href="#">Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI</a> ," RFC 4330, January 2006 ( <a href="#">TXT</a> ).

---

## Authors' Addresses

[TOC](#)

	Richard Gayraud
	Cisco Systems, Inc.
	Village ent. GreenSide, Bat T3,
	400, Av de Roumanille,
	06410 BIOT - Sophia-Antipolis Cedex
	France
Phone:	+33 4 97 23 26 49
Email:	<a href="mailto:rgayraud@cisco.com">rgayraud@cisco.com</a>
	Benoit Lourdelet
	Cisco Systems, Inc.
	Village ent. GreenSide, Bat T3,
	400, Av de Roumanille,
	06410 BIOT - Sophia-Antipolis Cedex
	France
Phone:	+33 4 97 23 26 23
Email:	<a href="mailto:blourdel@cisco.com">blourdel@cisco.com</a>

---

## Full Copyright Statement

[TOC](#)

Copyright © The IETF Trust (2008).

This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

## Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in

this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at [ietf-ipr@ietf.org](mailto:ietf-ipr@ietf.org).