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E. Lear
Cisco Systems GmbH
P. Eggert
UCLA
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A Timezone Option for DHCP
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Abstract

DHCP defines an option for a server to deliver to a client offset from UTC. This information in and of itself is not sufficient for devices to portray local time both accurately and consistently. This memo specifies a new option for both DHCPv4 and DHCPv6 to do so.

1. Introduction

Dynamic Host Configuration Protocol (DHCP) [2] provides a means for hosts to receive configuration information relating to their current location within an IP version 4 network. [4] similarly does so for IP version 6 networks. RFC2132 [3] specifies an option to provide a client timezone information in the form of an offset in seconds from UTC. The information provided in that option is insufficient for the client to determine whether it is in daylight saving time and when to change into and out of daylight saving time (DST). In order for the client to properly represent local wall clock time in a consistent and accurate fashion the DHCP server would have to time lease expirations of affected clients to the beginning or end of DST, thus effecting a self stress test (to say the least) at the appointed hour.

In addition, an offset is not sufficient to determine the actual timezone in which a client resides, and thus there is no means to derive a human readable display string such as "EST" or "EDT".

This memo specifies a means to provide hosts with more accurate timezone information than was previously available. There are currently three well known means to configure timezones:

- POSIX TZ strings
- Reference to the TZ Database
- Microsoft's timezone.xml

POSIX [1] provides a standard for how to express timezone information in a character string. Use of such a string can provide accuracy for at least one transition into and out of daylight saving time, and possibly for more transitions if the transitions are regular enough (e.g., "second Sunday in March at 02:00 local time"). However, for accuracy over longer periods, that involve daylight-saving rule changes or other irregular changes, a more detailed mechanism is necessary.

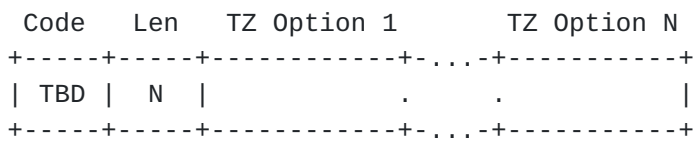
The so-called "TZ Database" [6] that is used in many operating systems provides backwards consistency and accuracy for almost all real-world locations since 1970. The TZ database also attempts to provide a stable set of human readable timezone identifiers. In addition, many systems already make use of the TZ database, and so the names used are a defacto standard.

The Microsoft TimeZone element conveys information similar to the POSIX string, but with an additional (presumably localized) display string.

1.1. What about VTIMEZONE elements from iCalendar?

VTIMEZONE elements are defined in the iCalendar specification.[8] Fully specified they provide a level of accuracy similar to the TZ database. However, because there is currently no global registry of VTIMEZONE TZIDs (although one has been proposed; see [9]), complete accuracy requires that a full entry must be specified. To achieve the same information would range from 300 octets upwards with no particular bound. Furthermore, at the time of this writing the author is aware of no operating system that natively takes advantage of VTIMEZONE entries. It might be possible to include an option for a TZURL. However, in a cold start environment, it will be bad enough that devices are stressing the DHCP server, and perhaps unwise to similarly afflict other components.

2. New Timezone Option for DHCPv4



Code is TBD and will be allocated by IANA according to RFC-2939 [5].

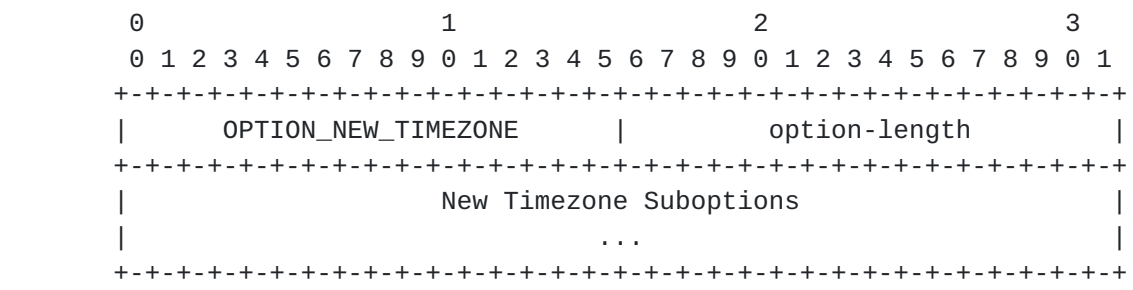
Len is the two-octet sum of the size of all following TZ options.

Suboptions are described later in this document.

3. New Timezone Option for DHCPv6

The semantics and content of the DHCPv6 encoding of this option are exactly the same as the encoding described in the previous section, other than necessary differences between the way options are encoded in DHCPv4 and DHCPv6.

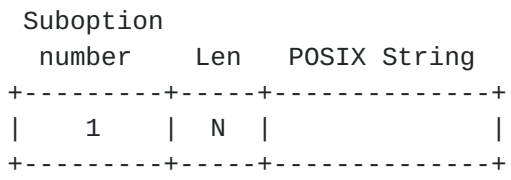
Specifically, the DHCPv6 new timezone option has the following format:



option-code: OPTION_NEW_TIMEZONE(TBD)

option-length: variable based on the number and value of suboptions.

4. The POSIX Suboption String



Suboption number is an octet with a value of 1.

Len is a single octet that contains the number of octets of the following string.

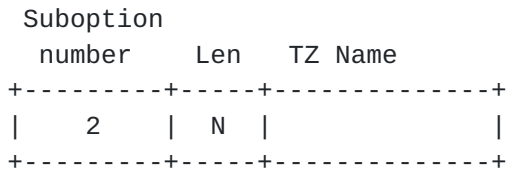
POSIX string is a string suitable for the TZ variable as specified by [1] in Section 8.3, with the exception that a string may not begin with a colon (":"). This string is NOT terminated by an ASCII NULL. An example might be as follows:

"EST5EDT4,M3.2.0/02:00,M11.1.0/02:00"

In this case, the string is interpreted as a timezone that is normally five hours behind UTC, and four hours behind UTC during DST, which runs from the second Sunday in March at 02:00 local time through the first Sunday in November at 02:00 local time. Normally the timezone is abbreviated "EST" but during DST it is abbreviated "EDT".

Clients and servers implementing the timezone option MUST support this suboption.

5. The TZ Database Suboption



Suboption number is an octet with a value of 2.

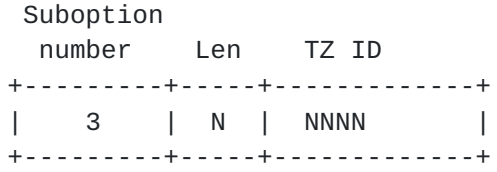
Len is a single octet that contains the number of octets of the following string.

TZ Name is the name of a Zone entry in the database commonly referred to as the TZ database. In order for this option to be useful, the client must already have a copy of the database. This string is NOT terminated with an ASCII NULL.

An example string would be "Europe/Zurich".

A client that supports this option SHOULD prefer this option to POSIX string if it recognizes the TZ Name that was returned. If it doesn't recognize the TZ Name the client MUST ignore this suboption.

6. The Microsoft TZ Suboption



Suboption number is an octet with a value of 3.

Len is a single octet that contains the size of the TZ ID field. This value will always be 1.

TZ ID is a four-octet integer in network byte order that references the timezone ID as defined in the TimeZone element, as specified by Microsoft [7].

A client that supports this option SHOULD prefer this option to the POSIX string if it recognizes the TZ ID that was returned by the

server. If it doesn't recognize the TZ ID the client MUST ignore this suboption.

7. Use of the timezone string(s) returned from the server

This specification presumes the DHCP server has some means of identifying which timezone the client is in. One obvious approach would be to associate a subnet or group of subnets with a timezone, and respond with this option accordingly.

As a matter of practicality the client will use this information at its discretion to configure the current timezone in which it resides.

It will periodically be necessary for a DHCP server to update the timezone string, based on administrative changes made by local jurisdictions (say, for instance, counties in Indiana). While the authors do not expect this to be a lower bound on a lease time in the vast majority of cases, there may be times when anticipation of a change dictates prudence, as certain governments give little if any notification.

8. The New Timezone Option and Lease times

When a lease has expired and new information is not forthcoming, the client MAY continue to use timezone information returned by the server. This follows the principle of least astonishment.

8.1. Deprecation of Time Offset Option

Because this option provides a superset of functionality to the previous IPv4 time offset option (tag 2), and in order to maintain consistency between IPv4 and IPv6 implementation, the older option is deprecated. Implementations of the time offset IPv4 option SHOULD implement this option as well. Others SHOULD instead implement this option.

9. Security Considerations

An attacker could provide erroneous information to a client. It is possible that someone might miss a meeting or otherwise show up early. If clients have job processing tools such as cron that operate on wall clock time it is possible that certain jobs could be triggered either earlier or later, or even repeated or skipped entirely if scheduled during a DST transition. In such cases, the client operating system might do well to confirm timezone changes

with a human.

Clients using the POSIX option should beware of any time zone setting specifying unusual characters (e.g., control characters) in the standard or daylight-saving abbreviations, as this might well trigger security-relevant bugs in applications.

Clients using the POSIX option should also be suspicious of any time zone setting whose UTC offset exceeds 25 hours (the POSIX limit, if the default daylight-saving offset is used). As of this writing, the maximum UTC offset is 14 hours in practice, but governments may extend this somewhat in the future.

10. IANA Considerations

The IANA is requested to allocate both DHCPv4 and DHCPv6 option codes for this purpose and reference this document in that allocation for both DHCPv4 and DHCPv6.

The IANA need not and should not retain a list of suboptions. Any new suboptions require further standards action.

The IANA is requested to annotate the time offset IPv4 option (tag 2) as deprecated, with a reference to this memo.

11. Acknowledgments

This document specifies a means to exchange timezone information. The hard part is actually collecting changes to the various databases from scattered sources around the world. The many volunteers on the mailing list tz@elsie.nci.nih.gov have done this nearly thankless task for many years. Thanks also go to Ralph Droms, Bernie Volz, Ted Lemon, Lisa Dusseault,and Simon Vaillancourt for their attempts to improve this work.

12. References

12.1. Normative References

[1] "Standard for Information Technology - Portable Operating System Interface (POSIX) - Base Definitions", IEEE Std 1003.1-2004, December 2004.

[2] Droms, R., "Dynamic Host Configuration Protocol", RFC 2131, March 1997.

[3] Alexander, S. and R. Droms, "DHCP Options and BOOTP Vendor Extensions", RFC 2132, March 1997.

[4] Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", RFC 3315, July 2003.

[5] Droms, R., "Procedures and IANA Guidelines for Definition of New DHCP Options and Message Types", BCP 43, RFC 2939, September 2000.

[6] Eggert, P. and A. Olson, "Sources for Time Zone and Daylight Saving Time Data", <http://www.twinsun.com/tz/tz-link.htm>.

[7] "The Microsoft TimeZone Element", <http://msdn.microsoft.com/library/>.

12.2. Informational References

[8] Dawson, F. and Stenerson, D., "Internet Calendaring and Scheduling Core Object Specification (iCalendar)", RFC 2445, November 1998.

[9] Royer, D., "Time Zone Registry", draft-royer-timezone-registry-03 (work in progress), August 2005.

Appendix A. Changes

[The RFC Editor is requested to remove this section at publication.]

- -00 (WG submission); add length field to Microsoft suboption, clarifying text about when to prefer which suboption, indicate that the POSIX string is NOT null terminated; add additional justification; add deprecation text; remove extraneous text that says that this document will not prescribe client behavior regarding multiple options (we just did).
- -02; fix references to the TZ database; add additional security considerations; clarify POSIX example; reference Doug Royer registry draft; add Paul Eggert as co-author(who did all the above)
- -01; clarify uses of each suboption; reset suboption sizes; add explanation for not using VTIMEZONEs; add acknowlegments.
- initial revision

Authors' Addresses

Eliot Lear
Cisco Systems GmbH
Glatt-com
Glattzentrum, ZH CH-8301
Switzerland

Phone: +41 1 878 9200
Email: lear@cisco.com

Paul Eggert
UCLA
Computer Science Department
4532J Boelter Hall
Los Angeles, CA 90095
USA

Phone: +1 310 825 3886
Email: eggert@cs.ucla.edu

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