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Dynamic Host Configuration Protocol (DHCPv4 and DHCPv6) Option for Civic Addresses Configuration Information
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Abstract

This document specifies a Dynamic Host Configuration Protocol (DHCPv4 and DHCPv6) option for the civic location of the client or the DHCP server. The Location Configuration Information (LCI) includes information about the country, administrative units such as states, provinces and cities, as well as street addresses and building information.

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1. Terminology

In this document, the key words "MUST", "MUSTNOT", "REQUIRED", "SHALL", "SHALLNOT", "SHOULD", "SHOULDNOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in RFC 2119 [1] and indicate requirement levels for compliant implementations.

2. Introduction

Many end system services can benefit by knowing the approximate location of the end device. In particular, IP telephony devices need to know their location to contact the appropriate emergency response agency and to be found by emergency responders.

There are two common ways to identify the location of an object, either through geospatial coordinates or by so-called civic address. Geospatial coordinates indicate longitude, latitude and altitude, while civic addresses indicate a street address.

The civic address is commonly, but not necessearily, closely related to the postal address, used by the local postal service to deliver mail. However, not all postal addresses correspond to street addresses. For example, the author's address is a postal address that does not appear on any street or building sign. Naturally, post office boxes would be unsuitable for the purposes described here. The term 'civil address' or 'jurisdictional address' is also sometimes used instead of civic address.

A related document [13] describes a DHCPv4 [2] option for conveying geospatial information to a device. This draft describes how DHCPv4 and DHCPv6 [5] can be used to convey the civic and postal address to devices. Both can be used simultaneously, increasing the chance to deliver accurate and timely location information to emergency responders.

End systems that obtain location information via the mechanism described here then use other protocol mechanisms to communicate this information to the emergency call center or to convey it as part of presence information.

Civic information is useful since it often provides additional, human-usable information particularly within buildings. Also, compared to geospatial information, it is readily obtained for most occupied structures and can often be interpreted even if incomplete. For example, for many large university or corporate campuses, geocoding information to building and room granularity may not be readily available.

Unlike geospatial information, the format for civic and postal information differs from country to country. Thus, this draft establishes an IANA registry for civic location data fields. The initial set of data fields is derived from standards published by the United States National Emergency Number Association (NENA) [16]. It is anticipated that other countries can reuse many of the data elements.

The same civic and postal address information can often be rendered in multiple languages and scripts. For example, Korean addresses are often shown in Hangul, Latin and Kanji, while some older cities have multiple language variants (Munich, Muenchen and Monaco, for example). Since DHCPv4 and DHCPv6 do not currently support a mechanism to query for a specific script or language, the DHCP server SHOULD provide all common renderings to the client and MUST provide at least the rendering in the language and script appropriate to the location indicated. For example, for use in presence information, the target may be visiting from a foreign country and want to convey the information in a format suitable for watchers in its home country. For emergency services, the rendering in the local language is likely to be most appropriate. To provide multiple renderings, the server repeats sequences of address elements, prefixing each with 'language' and/or 'script' element (see Section 3.3). The language and script remain in effect for subsequent elements until overridden by another language or script element.

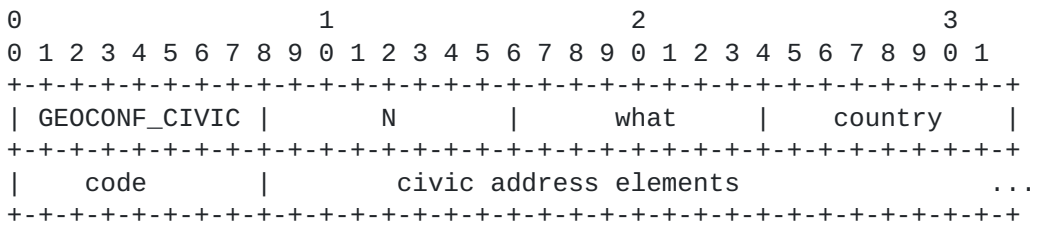
The DHCP server MAY provide location information for multiple locations related to the target, for example, both the network element and the network jack itself. This is likely to help in debugging network problems, for example.

As discussed in Security Considerations (Section 6), the GEOCONF_CIVIC option SHOULD be returned by DHCPv4 servers only when the DHCPv4 client has included this option in its 'parameter request list' (RFC 2131 [2], Section 3.5). Similarly, the OPTION_GEOCONF_CIVIC option SHOULD be returned by DHCPv6 servers only when the DHCPv6 client has included this option in its OPTION_ORO.

The DHCPv4 long-options mechanism described in RFC 3396 [8] MUST be used if the civic address option exceeds the maximum DHCPv4 option size of 255 octets.

3. Format of the DHCP Civic Location Option

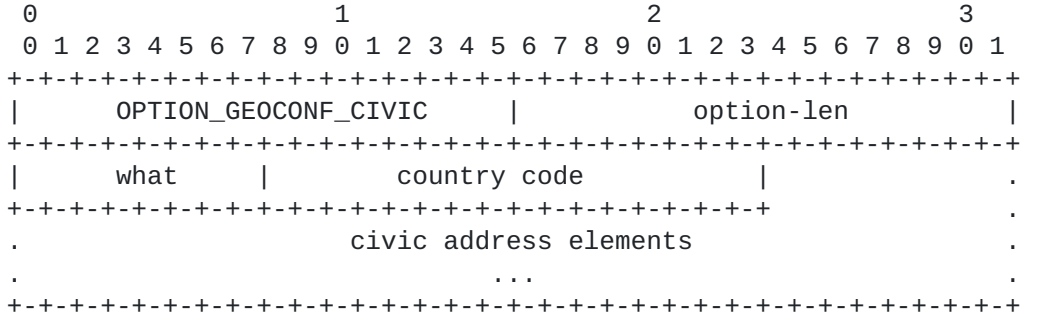
3.1 Overall Format for DHCPv4



Code GEOCONF_CIVIC: The code for this DHCP option is TBD by IANA.
N: The length of this option is variable. The minimum length is 3.
what: The 'what' element describes which location the DHCP entry refers to. Currently, three options are defined: the location of the DHCP server (a value of 0), the location of the network element believed to be closest to the client (a value of 1) or the location of the client (a value of 2). Option (2) SHOULD be used, but may not be known. Options (0) and (1) SHOULD NOT be used unless it is known that the DHCP client is in close physical proximity to the server or network element.
country code: The two-letter ISO 3166 country code in capital ASCII letters, e.g., DE or US. (Civic addresses always contain country designations, suggesting the use of a fixed-format field to save space.)
civic address elements: Zero or more elements comprising the civic and/or postal address, with the format described below (Section 3.3).

3.2 Overall Format for DHCPv6

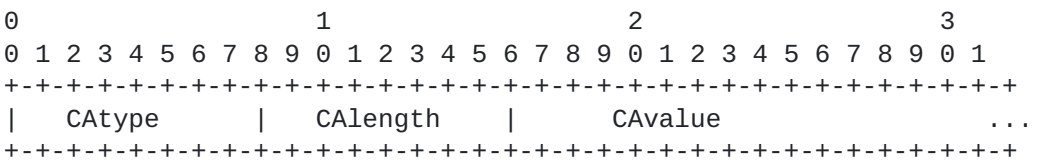
The DHCPv6 [5] civic address option refers generally to the client as a whole.



option-code: OPTION_GEOCONF_CIVIC (TBD)
option-len: Length of the Countrycode, 'what' and civic address elements.
what: See above (Section 3.1).
country code: See above (Section 3.1).
civic address elements: See above (Section 3.1).

3.3 Element Format

For both DHCPv4 and DHCPv6, each civic address element has the following format:



CAtype: A one-octet descriptor of the data civic address value.
CAlength: The length, in octets, of the CAvalue, not including the CAlength field itself.
CAvalue: The civic address value, as described in detail below.

3.4 Civic Address Components

Since each country has different administrative hierarchies, with often the same (English) names, this specification adopts a simple hierarchical notation that is then instantiated for each country. We assume that five levels are sufficient for sub-national divisions above the street level.

All elements are OPTIONAL and can appear in any order.

Component values MUST be encoded as UTF-8 [6]. They SHOULD be written in mixed case, following the customary spelling. The script indication (CAtype=128) MUST be written in mixed-case, with the first letter a capital letter.

Abbreviations MUST NOT be used unless indicated for each element. Abbreviations do not need a trailing period.

It is RECOMMENDED that all elements in a particular script (CAtype 128) and language (CAtype 0) be grouped together as that reduces the number of script and language identifiers needed.

For each script and language, elements SHOULD be included in numeric order from lowest to highest of their CAtype. In general, an element is labeled in its language and script by the most recent 'language

tag' (CAtype = 0) element preceding it. Since not all elements depend on the script and language, a client accumulates the elements by CAtype and then selects the most desirable language and script rendition if there are multiple elements for the same CAtype.

CAtype	label	description
1	A1	national subdivisions (state, region, province, prefecture)
2	A2	county, parish, gun (JP), district (IN)
3	A3	city, township, shi (JP)
4	A4	city division, borough, city district, ward, chou (JP)
5	A5	neighborhood, block
6	A6	street

+

Table 1

For specific countries, the administrative sub-divisions are described below.

CA (Canada): The mapping to NENA designations is shown in parentheses. A1=province (STA); A2=county (CNA); A3=city or town (MCN); A6=street (STN).

DE (Germany): A1=state (Bundesstaat); A2=county (Regierungsbezirk); A3=city (Stadt, Gemeinde); A4=district (Bezirk); A6=street (Strasse). Street suffixes (STS) are used only for designations that are a separate word (e.g., Marienthaler Strasse).

JP (Japan): A1=metropolis (To, Fu) or prefecture (Ken, Do); A2=city (Shi) or rural area (Gun); A3=ward (Ku) or village (Mura); A4=town (Chou or Machi); A5=city district (Choume); A6=block (Banchi or Ban).

KR (Korea): A1=province (Do); A2=county (gun); A3=city or village (ri); A4=urban district (gu); A5=neighborhood (dong); A6=street (no, ro, ga or gil).

US (United States): The mapping to NENA designations is shown in parentheses. A1=state (STA), using the the two-letter state and possession abbreviations recommended by the United States Postal Service Publication 28 [15], Appendix B; A2=county (CNA); A3=civic community name (city or town) (MCN); A6=street (STN). A4 and A5 are not used. The civic community name (MCN) reflects the political boundaries. These may differ from postal delivery assignments for historical or practical reasons.

Additional CA types appear in many countries and are simply omitted where they are not needed or known:

CAtype	NENA	PIDF	Description	Examples
0			language	i-default [3]
16	PRD	PRD	leading street direction	N
17	POD	POD	trailing street suffix	SW
18	STS	STS	street suffix	Ave, Platz
19	HNO	HNO	house	123

			number	
20	HNS	HNS	house number suffix	A, 1/2
21	LMK	LMK	landmark or vanity address	Columbia University
22	LOC	LOC	additional location information	South Wing
23	NAM	NAM	name	Joe'S

			(residence and office occupant)	Barbershop
24	ZIP	PC	postal/zip code	10027-1234
25			building (structure)	Low Library
26			unit (apartment, suite)	Apt 42
27		FLR	floor	4
28			room number	450F
29			placetype	office
30	PCN		postal community name	Leonia
31			post office box (P.O.	12345

			Box)	
128			script	Latn
255			reserved	

The CA types labeled in the second column correspond to items from the NENA "Recommended Formats & Protocols For ALI Data Exchange, ALI Response & GIS Mapping" [16], but are applicable to most countries. The "NENA" column refers to the data dictionary name in Exhibit 18 of [16].

The column labeled PIDF indicates the element name from [14].

The "language" item (CAtype 0) optionally identifies the language used for presenting the address information, drawing from the tags for identifying languages in [7]. If omitted, the default value for this tag is "i-default" [3].

The "script" item (CAtype 128) optionally identifies the script used for presenting the address information, drawing from the tags for

identifying scripts in ISO 15924 [11]. If omitted, the default value for this tag is "Latn".

The abbreviations N, E, S, W, and NE, NW, SE, SW SHOULD be used for POD and PRD in English-speaking countries.

STS designates a street suffix. In the United States (US), the abbreviations recommended by the United States Postal Service Publication 28 [15], Appendix C, SHOULD be used.

HNS ("house number") is a modifier to a street address; it does not identify parts of a street address.

LMK ("landmark") is a string name for a location. It conveys the same information as the street address, but reflects common local designation of a structure, a group of buildings or a place that helps recipients locate the place. For example, an industrial park may have a widely-recognized name that is more readily found than a single street address. Some places, such as parks, may not have street names or house numbers and SHOULD be identified by a LMK string. In addition, this component can be used to indicate where postal delivery locations differ from the jurisdictional one.

LOC ("location") is an unstructured string.

The postal community name (CAtype 30) and the post office box (CAtype 31) allow the recipient to construct a postal address. The post office box field should contain the words "P.O. Box" or other locally appropriate postal designation.

The NAM object is used to aid user location ("Joe Miller" "Alice's Dry Cleaning"). It does not identify the person using a communications device, but rather the person or organization associated with the address.

While a landmark (LMK) can indicate a complex of buildings, 'building' (CAtype 25) conveys the name of a single building if the street address includes more than one building or the building name is helpful in identifying the location. (For example, on university campuses, the house number is often not displayed on buildings, while the building name is prominently shown.)

The 'unit' object (CAtype 26) contains the name or number of a part of a structure where there are separate administrative units, owners or tenants, such as separate companies or families who occupy that structure. Common examples include suite or apartment designations.

A 'room' is the smallest identifiable subdivision of a structure.

The "type of place" item (CAtype 29) describes the type of place described by the civic coordinates. For example, it describes whether it is a home, office, street or other public space. The values are drawn from the items in the rich presence [17] document. This information makes it easy, for example, for the DHCP client to then populate the presence information. Since this is an IANA-registered token, the language and script designations do not apply for this element.

4. Postal Addresses

In general, a recipient can construct a postal address by using all language-appropriate elements, including the postal code (ZIP, CAtype 24). However, certain elements override the civic address components to create a postal address. If the elments include a post office box (CAtype 31), the street address components (A6, PRD, POD, STS, HNO, HNS) are replaced with the post office box element. If a postal community name is specified, the civic community name (typically, A3) is replaced by the postal community name (PCN, CAtype 30). Country-specific knowledge is required to create a valid postal address. The formating of such addresses is beyond the scope of this document.

5. Example

Rather than showing the precise byte layout of a DHCP option, we show a symbolic example below, representing the civic address of the Munich city hall in Bavaria, Germany. The city and state name are also conveyed in English and Italian in addition to German; the other items are assumed to be common across all languages. All languages use the latin script.

CAtype	CAvalue
0	de
128	Latn
1	Bayern
2	Oberbayern
3	M=U+00FCnchen
6	Marienplatz
19	8
21	Rathaus
24	80331
25	public
31	Postfach 1000
0	en
1	Bavaria
3	Munich
0	it
1	Baviera
3	Monaco

6. Security Considerations

Where critical decisions might be based on the value of this GEOCONF_CIVIC option, DHCPv4 authentication in RFC3118 [4] SHOULD be used to protect the integrity of the DHCP options.

Since there is no privacy protection for DHCP messages, an eavesdropper who can monitor the link between the DHCP server and requesting client can discover the information contained in this option. Thus, usage of this option on networks without access restrictions or network-layer or link-layer privacy mechanisms is NOT RECOMMENDED.

To minimize the unintended exposure of location information, the GEOCONF_CIVIC option SHOULD be returned by DHCPv4 servers only when the DHCPv4 client has included this option in its 'parameter request list' (RFC 2131 [2], Section 3.5). Similarly, the OPTION_GEOCONF_CIVIC option SHOULD be returned by DHCPv6 servers only when the DHCPv6 client has included this option in its OPTION_ORO.

7. IANA Considerations

This document requests that IANA register a new DHCPv4 and DHCPv6 option code for the Civic Address (GEOCONF_CIVIC and OPTION_GEOCONF_CIVIC, respectively).

This document establishes a new IANA registry for CAtypes designating civic address components. According to RFC 2434 [12], this registry operates under the "Specification Required" rules. The IANA registration needs to include the following information:

CAtype: Numeric identifier, assigned by IANA.
Brief description: Short description identifying the meaning of the element.
Reference to published specification: A stable reference to an RFC or other permanent and readily available reference, in sufficient detail so that interoperability between independent implementations is possible.
Country-specific considerations: If applicable, notes whether the element is only applicable or defined for certain countries.

Updates to country-specific considerations for previously-defined CAtypes follow the same procedure. Such documents may provide the interpretation of elements A1 through A6 for additional countries. Approval by a Designated Expert is required.

The initial list of registrations is contained in .

8. References

8.1 Normative References

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[3] Alvestrand, H., "IETF Policy on Character Sets and Languages", BCP 18, RFC 2277, January 1998.

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[10] Sugano, H. and S. Fujimoto, "Presence Information Data Format (PIDF)", draft-ietf-impp-cpim-pidf-08 (work in progress), May 2003.

[11] International Organization for Standardization, ISO., "Information and documentation - Codes for the representation of names of scripts", February 2004.

8.2 Informative References

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Configuration Protocol Option for Coordinate-based Location Configuration Information", RFC 3825, July 2004.

[14] Peterson, J., "A Presence-based GEOPRIV Location Object Format", draft-ietf-geopriv-pidf-lo-03 (work in progress), September 2004.

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