

GEOPRIV -- Geographic
Location/Privacy Working Group
Internet-Draft
Expires: March 25, 2010

A. Mayrhofer
nic.at
C. Spanring
September 21, 2009

A Uniform Resource Identifier for Geographic Locations ('geo' URI)
draft-ietf-geopriv-geo-uri-03

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of [BCP 78](#) and [BCP 79](#). This document may contain material from IETF Documents or IETF Contributions published or made publicly available before November 10, 2008. The person(s) controlling the copyright in some of this material may not have granted the IETF Trust the right to allow modifications of such material outside the IETF Standards Process. Without obtaining an adequate license from the person(s) controlling the copyright in such materials, this document may not be modified outside the IETF Standards Process, and derivative works of it may not be created outside the IETF Standards Process, except to format it for publication as an RFC or to translate it into languages other than English.

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 March 25, 2010.

Copyright Notice

Copyright (c) 2009 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal

Internet-Draft

'geo' URI Scheme

September 2009

Provisions Relating to IETF Documents in effect on the date of publication of this document (<http://trustee.ietf.org/license-info>). Please review these documents carefully, as they describe your rights and restrictions with respect to this document.

Abstract

This document specifies a Uniform Resource Identifier (URI) for geographic locations using the 'geo' scheme name. A 'geo' URI identifies a physical location in a two- or three-dimensional coordinate reference system in a compact, simple, human-readable, and protocol independent way. The default coordinate reference system used is WGS-84.

Internet-Draft

'geo' URI Scheme

September 2009

Table of Contents

1.	Introduction	5
2.	Terminology	6
3.	IANA Registration of 'geo' URI Scheme	6
3.1.	URI Scheme Name	7
3.2.	Status	7
3.3.	URI Scheme Syntax	7
3.4.	URI Scheme Semantics	8
3.4.1.	Coordinate Reference System Identification	8
3.4.2.	Component Description for WGS-84	8
3.4.3.	Location Uncertainty	9
3.4.4.	URI Comparison	9
3.4.5.	Interpretation of Undefined Altitude	10
3.5.	Encoding Considerations	10
3.6.	Applications/Protocols that use this URI Scheme	10
3.7.	Interoperability Considerations	11
3.8.	Contact	11
3.9.	Author/Change controller	11
3.10.	References	11
4.	'geo' URI Parameters Registry	11
5.	URI Operations	12
6.	Use Cases and Examples	13
6.1.	Plain 'geo' URI Example	13
6.2.	Hyperlink	13
6.3.	'geo' URI in 2-dimensional barcode	14
7.	GML Mappings	14
7.1.	2D GML 'Point'	15
7.2.	3D GML 'Point'	15
7.3.	GML 'Circle'	15

7.4.	GML 'Sphere'	16
8.	IANA Considerations	16
8.1.	'geo' URI Scheme	16
8.2.	URI Parameter Registry	17
8.2.1.	Registry Contents	17
8.2.2.	Registration Policy	17
9.	Security Considerations	17
9.1.	Invalid Locations	18
9.2.	Location Privacy	18

10.	Acknowledgements	18
11.	References	18
11.1.	Normative References	18
11.2.	Informative References	19
Appendix A.	Change Log	19
Authors' Addresses	20

1. Introduction

An increasing number of Internet protocols and data formats are extended by specifications for adding spatial (geographic) location. In most cases, latitude as well as longitude of simple points are added as new attributes to existing data structures. However, all those methods are very specific to a certain data format or protocol, and don't provide a protocol independent, compact and generic way to refer to a physical geographic location.

Location-aware applications and location-based services are fast emerging on the Internet. Most web search engines use geographic information, and a vivid open source mapping community has brought an enormous momentum into location aware technology. A wide range of tools and data sets which formerly were accessible to professionals only have become available to a wider audience.

The 'geo' URI scheme is another step into that direction and aims to facilitate, support and standardize the problem of location identification in geospatial services and applications. Accessing information about a particular location or triggering further services shouldn't be any harder than clicking on a 'mailto:' link

and writing an email straight away.

According to [[RFC3986](#)], a Uniform Resource Identifier (URI) is "a compact sequence of characters that identifies an abstract or physical resource". The 'geo' URI scheme defined in this document identifies geographic locations (physical resources) in a coordinate references system (CRS), per default in World Geodetic System 1984 (WGS-84) [[WGS84](#)]. The scheme provides the textual representation of the location's spatial coordinates in either two or three dimensions (latitude, longitude, and optionally altitude for the default CRS of WGS-84).

Such URIs are independent from a specific protocol, application, or data format, and can be used in any other protocol or data format that supports inclusion of arbitrary URIs.

For the sake of usability, the definition of the URI scheme is strictly focused on the simplest, but also most common representation of a spatial location - a single point in a well known CRS. The provision of more complex geometries or locations described by civic addresses is out of scope of this document.

The optional 'crs' URI parameter described below may be used by future specifications to define the use of CRSes other than WGS-84. This is primarily intended to cope with the case of another CRS replacing WGS-84 as the predominantly used one, rather than allowing

the arbitrary use of thousands of CRSes for the URI (which would clearly affect interoperability). The definition of 'crs' values beyond the default of "wgs84" is therefore out of scope of this document.

Note: The choice of WGS-84 as the default CRS is based on the widespread availability of Global Positioning System (GPS) devices, which use the WGS-84 reference system. It is anticipated that such devices will serve as one of the primary data sources for authoring 'geo' URIs, hence the adoption of the native GPS reference system for the URI scheme. Also, many other data formats for representing geographic locations use the WGS-84 reference system, which makes transposing from and to such data formats less error prone (no re-projection involved). It is also believed that the burden of potentially required spatial transformations should be put on the

author rather than the consumer of 'geo' URI instances.

[2.](#) Terminology

Geographic locations in this document are defined using WGS 84 (World Geodetic System 1984), equivalent to the International Association of Oil & Gas Producers (OGP) Surveying and Positioning Committee EPSG (European Petroleum Survey Group) code 4326 (2 dimensions) and 4979 (3 dimensions). This document does not assign responsibilities for coordinate transformations from and to other Spatial Reference Systems.

A 2-dimensional WGS-84 coordinate value is here represented as a comma-delimited latitude/longitude pair, measured in decimal degrees (un-projected). A 3-dimensional WGS-84 coordinate value is here represented by appending a comma-delimited altitude value in meters to such pairs.

Latitudes range from -90 to 90 and longitudes range from -180 to 180. Coordinates in the Southern and Western hemispheres as well as altitudes below the WGS-84 reference geoid are signed negative with a leading dash.

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 [RFC 2119](#) [[RFC2119](#)].

[3.](#) IANA Registration of 'geo' URI Scheme

This section contains the fields required for the URI scheme registration, following the guidelines in [section 5.4 of \[RFC4395\]](#).

[3.1.](#) URI Scheme Name

geo

[3.2.](#) Status

permanent

3.3. URI Scheme Syntax

The syntax of the 'geo' URI scheme is specified below in Augmented Backus-Naur Form (ABNF) [[RFC5234](#)]:

```
geo-URI      = geo-scheme ":" geo-path
geo-scheme   = "geo"
geo-path     = coordinates p
coordinates  = coord-a "," coord-b [ "," coord-c ]

coord-a     = num
coord-b     = num
coord-c     = num

p           = [ crsp ] [ uncp ] *parameter
crsp        = ";crs=" crslabel
crslabel    = "wgs84" / labeltext
uncp        = ";u=" pnum
parameter   = ";" pname [ "=" pvalue ]
pname       = labeltext
pvalue      = 1*paramchar
paramchar   = p-unreserved / unreserved / pct-encoded

labeltext   = 1*( alphanum / "-" )
pnum        = 1*DIGIT [ "." 1*DIGIT ]
num         = [ "-" ] pnum
unreserved  = alphanum / mark
mark        = "-" / "_" / "." / "!" / "~" / "*" /
             "'" / "(" / ")"
pct-encoded = "%" HEXDIG HEXDIG
p-unreserved = "[" / "]" / "/" / ":" / "&" / "+" / "$"
alphanum    = ALPHA / DIGIT
```

Both 'crs' and 'u' parameters MUST NOT appear more than once each. The 'crs' and 'u' parameters MUST be given before any other parameters that may be defined in future extensions. The 'crs' parameter MUST be given first if both 'crs' and 'u' are used. The definition of other parameters, and 'crs' values beyond the default value of "wgs84" is out of scope of this document. [Section 8.2](#) discusses the IANA registration of such additional parameters and

In case the URI identifies a location in the default CRS of WGS-84, its sub-components are further restricted as follows:

coord-a	=	latitude
coord-b	=	longitude
coord-c	=	altitude
latitude	=	["-"] 1*2DIGIT ["." 1*DIGIT]
longitude	=	["-"] 1*3DIGIT ["." 1*DIGIT]
altitude	=	["-"] 1*DIGIT ["." 1*DIGIT]

[3.4.](#) URI Scheme Semantics

Data contained in a 'geo' URI identifies a physical resource: a spatial location identified by the geographic coordinates and the CRS encoded in the URI.

[3.4.1.](#) Coordinate Reference System Identification

The semantics of the 'coordinates' component depends on the CRS of the URI. The CRS itself is identified by the optional 'crs' parameter. A URI instance uses the default WGS-84 CRS if the 'crs' parameter is either missing, or contains the value of 'wgs84'. Other 'crs' values are currently not defined, but may be specified by future documents.

Interpretation of coordinates in the wrong CRS produces invalid location information. Consumers of 'geo' URIs therefore MUST NOT ignore the 'crs' parameter if given, and MUST NOT interpret the 'coordinates' component without considering and understanding the 'crs' parameter value.

The following component description refers to the use of the default CRS (WGS-84) only. Future documents specifying other 'crs' parameter values MUST provide similar descriptions for the 'coordinates' sub-components in the described CRS.

[3.4.2.](#) Component Description for WGS-84

The "latitude", "longitude" and "altitude" components as specified in the URI scheme syntax ([Section 3.3](#)) are to be used as follows:

- o The "latitude" component MUST contain the latitude of the identified location in decimal degrees in the reference system WGS-84.

- o The "longitude" component MUST contain the longitude of the identified location in decimal degrees in the reference system WGS-84.
- o If present, the OPTIONAL "altitude" component MUST contain the identified altitude in meters in the reference system WGS-84.

If the altitude of the location is unknown, the "altitude" component MUST NOT be present in the URI. Specifically, unknown altitude MUST NOT be represented by setting the 'altitude' component to "0" (or any other arbitrary value).

The "longitude" components of coordinate values reflecting the poles (latitude set to -90 or 90 degrees) SHOULD be set to "0", although consumers of "geo" URIs MUST accept such URIs with any longitude value from -180 to 180.

'geo' URIs with longitude values outside the range of -180 to 180 decimal degrees or with latitude values outside the range of -90 to 90 degrees MUST be considered invalid.

[3.4.3.](#) Location Uncertainty

The 'u' ("uncertainty") parameter indicates the amount of uncertainty in the location as a value in meters. Where a 'geo' URI is used to identify the location of a particular object, uncertainty indicates the uncertainty with which the identified location of the subject is known.

The 'u' parameter is optional and it can appear only once. If uncertainty is not specified, this indicates that uncertainty is unknown or unspecified. If the intent is to indicate a specific point in space, uncertainty MAY be set to zero. Zero uncertainty and absent uncertainty are never the same thing.

The single uncertainty value is applied to all dimensions given in the URI.

Note: The number of digits of the value in the 'coordinates' component MUST NOT be interpreted as an indication to uncertainty.

[3.4.4.](#) URI Comparison

Two 'geo' URIs are equal when they use the same CRS, and their 'coord-a', 'coord-b', 'coord-c' and 'u' values are mathematically identical.

Two URIs use the same CRS if both have the 'crs' parameter omitted, or both have the same 'crs' parameter value, or one has the 'crs'

parameter omitted while the other URI specifies the default CRS explicitly with a 'crs' parameter value of "wgs84".

For the default CRS of WGS-84, the following definitions apply in addition:

- o Where the 'latitude' component of a 'geo' URI is set to either 90 or -90 degrees, the 'longitude' component MUST be ignored in comparison operations ("poles case").
- o A 'longitude' component of 180 degrees MUST be considered equal to a 'longitude' component of -180 degrees for the purpose of URI comparison ("date line" case).

An URI with undefined (missing) 'coord-c' (altitude) value MUST NOT be considered equal to an URI containing an 'coord-c' value, even if the remaining 'coord-a', 'coord-b' and 'u' values are equivalent.

[3.4.5.](#) Interpretation of Undefined Altitude

A consumer of a 'geo' URI in the WGS-84 CRS with undefined 'altitude' MAY assume that the URI refers to the respective location on Earth's physical surface at the given 'latitude' and 'longitude' coordinates.

However, as defined above, altitudes are relative to the WGS-84 reference geoid rather than Earth's surface. Hence, an altitude value of 0 MUST NOT be mistaken to refer to "ground elevation".

[3.5.](#) Encoding Considerations

The 'coordinates' path component of the 'geo' URI (see [Section 3.3](#)) uses a comma (",") as the delimiter for subcomponents. This delimiter MUST NOT be percent encoded.

It is RECOMMENDED that for readability the contents of 'coord-a', 'coord-b' and 'coord-c' subcomponents, as well as the 'crs' and 'u' parameters are never percent encoded.

Regarding internationalization, the currently specified components do allow for ASCII characters exclusively, and therefore don't require internationalization. Future specifications of additional parameters

might allow for introduction of non-ASCII values. Such specifications MUST describe internationalization considerations for those parameters and their values.

[3.6.](#) Applications/Protocols that use this URI Scheme

As many other URI scheme definitions, the 'geo' URI provides resource identification independent of a specific application or protocol. Examples of potential protocol mappings and use cases can be found in

[Section 6.](#)

[3.7.](#) Interopability Considerations

Like other new URI schemes, the 'geo' URI requires support in client applications. Users of applications which are not aware of the 'geo' scheme are likely not able to make direct use of the information in the URI. However, the simple structure of the 'geo' URI would allow even manual dereference by humans.

Clients MUST NOT attempt to dereference URIs given in an CRS that is unknown to the client, because doing so would produce entirely bogus results.

Authors of 'geo' URIs should carefully check that coordinate components are set in the right CRS and in the specified order, since wrong order of those components (or use of coordinates in a different CRS without transformation) are commonly observed mistakes producing completely bogus locations.

The number of digits in the coordinates values MUST NOT be interpreted as an indication to a certain level of accuracy or uncertainty.

[3.8.](#) Contact

Alexander Mayrhofer <alexander.mayrhofer@nic.at>
Christian Spanring <cspanring@gmail.com>

[3.9.](#) Author/Change controller

The 'geo' URI scheme is registered under the IETF part of the URI

tree. As such, change control is up to the IETF.

[3.10.](#) References

RFC XXXX [change to RFC number once assigned]

4. 'geo' URI Parameters Registry

This specification creates a new IANA Registry named "'geo' URI Parameters Registry". Parameters for the 'geo' URI and values for these parameters MUST be registered with IANA to prevent namespace collisions, and provide interoperability.

Some parameters accept values that are constrained by a syntax definition only, while others accept values from a predefined set

only. Some parameters might not accept any values at all ("flag" type parameter).

The registration of values is REQUIRED for parameters that accept values from a predefined set only.

The specification of a parameter MUST fully explain the syntax, intended usage and semantics of the parameter. This ensures interoperability between independent implementations.

For parameters that are neither restricted to a set of predefined values nor of the "flag" type described above, the syntax of allowed values MUST be described in the specification, for example by using ABNF.

Documents defining new parameters (or new values for existing parameters) MUST register them with IANA, as explained in [Section 8.2](#).

The 'geo' URI Parameter Registry contains a column named "Value Restriction" that describes whether or not a parameter accepts a value, and whether values are restricted to a predefined set. That column accepts the following values:

- o "No value": The parameter does not accept any values, and is to be

- used as a "flag" only.
- o "Predefined": The parameter does accept values from a predefined set only, as specified in a RFC or other permanent and readily available public specification.
 - o "Constrained": The parameter accepts arbitrary values that are only constrained by a syntax as specified in a RFC or other permanent and readily available public specification.

[Section 8.2.1](#) contains the initial contents of the Registry.

[5.](#) URI Operations

Currently, just one operation on a 'geo' URI is defined - location dereference: In that operation, a client dereferences the URI by extracting the geographical coordinates from the URI path component ('geo-path' in the ABNF). Further use of those coordinates (and the uncertainty value from the 'u' parameter) is then up to the application processing the URI, and might depend on the context of the URI.

An application may then use this location information for various purposes, for example:

- o A web browser could use that information to open a web mapping service of the user's choice, and display a map of the location
- o A navigational device such as a Global Positioning System (GPS) receiver could offer the user to start navigation to the location.

Note that the examples and use cases above as well as in the next section are non-normative, and provided for information only.

[6.](#) Use Cases and Examples

[6.1.](#) Plain 'geo' URI Example

The following 3-dimensional 'geo' URI example references to the office location of one of the authors in Vienna, Austria:

`geo:48.2010,16.3695,183`

A user could type the data extracted from this URI into a electronic navigation device, or even use it to locate the identified location on a paper map.

6.2. Hyperlink

'geo' URIs (like any other URI scheme) could also be embedded as hyperlinks in web pages. A Hyper Text Markup Language (HTML) snippet with such a hyperlink could look like:

```
<p>one of Vienna's popular sights is the  
<a href='geo:48.198634,16.371648;crs=wgs84'>Karlskirche</a>.
```

A web browser could extract the coordinates from the HTML snippet, and offer the user various options (based on configuration, context), for example:

- o Display a small map thumbnail when the mouse pointer hovers over the link.
- o Switch to a mapping service of the user's choice once the link is selected.
- o Locate nearby resources, for example by comparing the 'geo' URI with locations extracted from GeoRSS feeds the user has subscribed to.

- o Convert the coordinates to a format suitable for uploading to a navigation device.

Note that the URI in this example also makes use of the explicit specification of the CRS by using the 'crs' parameter.

6.3. 'geo' URI in 2-dimensional barcode

Due to it's short length, a 'geo' URI could easily be encoded in 2-dimensional barcodes. Such barcodes could be printed on business cards, flyers, paper maps and subsequently used by mobile devices,

for example as follows:

1. User identifies such a barcode on a flyer and uses the camera on his mobile phone to photograph and decode the barcode
2. The mobile phone dereferences the 'geo' URI, and offers the user to calculate a navigation route to the identified location.
3. Using the builtin GPS receiver, the user follows the navigation instructions to reach the location

7. GML Mappings

The Geographic Markup Language (GML) by the Open Geospatial Consortium (OGC) is a set of XML schemas to represent geographical features. Since GML is widely accepted, this document includes instructions on how to transform 'geo' URIs from and to GML documents. The instructions in this section are not normative.

For the following sections, "%lat%", "%lon%", "%alt%" and "%unc%" are placeholders for latitude, longitude, altitude and uncertainty values, respectively. The mappings use WGS-84, and are defined in the following sections.

Note: GML documents in other reference systems could be used as well if a transformation into "urn:ogc:def:crs:EPSG::4979" or "urn:ogc:def:crs:EPSG::4326" is defined and applied before the mapping step. Such transformations are typically not lossless.

GML uses the 'double' type from XML schema, and the mapping examples assume that numbers in the form of "3.32435e2" in GML are properly converted to decimal when placed into the 'geo' URI.

7.1. 2D GML 'Point'

A 2D GML 'Point' [[RFC5491](#)] is constructed from a 'geo' URI that has two coordinates and an uncertainty ('u') parameter that is absent or

zero. A GML point is always converted to a 'geo' URI that has no uncertainty parameter.

'geo' URI:

```
geo:%lat%,%lon%
```

GML document:

```
<Point srsName="urn:ogc:def:crs:EPSG::4326"
      xmlns="http://www.opengis.net/gml">
  <pos>%lat% %lon%</pos>
</Point>
```

Note that a 'geo' URI with an uncertainty value of zero is converted to a GML 'Point', but a GML 'Point' cannot be translated to a 'geo' URI with zero uncertainty.

[7.2.](#) 3D GML 'Point'

A 3D GML 'Point' [[RFC5491](#)] is constructed from a 'geo' URI that has three coordinates and an uncertainty parameter that is absent or zero. A GML point is always converted to a 'geo' URI that has no uncertainty parameter.

'geo' URI:

```
geo:%lat%,%lon%,%alt%
```

GML document:

```
<Point srsName="urn:ogc:def:crs:EPSG::4979"
      xmlns="http://www.opengis.net/gml">
  <pos>%lat% %lon% %alt%</pos>
</Point>
```

[7.3.](#) GML 'Circle'

A GML 'Circle' [[RFC5491](#)] is constructed from a 'geo' URI that has two coordinates and an uncertainty parameter that is present and non-zero.

'geo' URI:

geo:%lat%,%lon%;u=%unc%

GML document:

```
<gs:Circle srsName="urn:ogc:def:crs:EPSG::4326"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:gs="http://www.opengis.net/pidflo/1.0">
  <gml:pos>%lat% %lon%</gml:pos>
  <gs:radius uom="urn:ogc:def:uom:EPSG::9001">
    %unc%
  </gs:radius>
</gs:Circle>
```

[7.4.](#) GML 'Sphere'

A GML 'sphere' [[RFC5491](#)] is constructed from a 'geo' URI that has three coordinates and an uncertainty parameter that is present and non-zero.

'geo' URI:

geo:%lat%,%lon%,%alt%;u=%unc%

GML document:

```
<gs:Sphere srsName="urn:ogc:def:crs:EPSG::4979"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:gs="http://www.opengis.net/pidflo/1.0">
  <gml:pos>%lat% %lon% %alt%</gml:pos>
  <gs:radius uom="urn:ogc:def:uom:EPSG::9001">
    %unc%
  </gs:radius>
</gs:Sphere>
```

[8.](#) IANA Considerations

[8.1.](#) 'geo' URI Scheme

This document requests assignment of the 'geo' URI scheme in the IETF part of the URI scheme tree, according to the guidelines in [BCP 115](#) ([RFC 4395](#)) [[RFC4395](#)]. The definitions required for the assignment are contained in [Section 3](#).

[8.2.](#) URI Parameter Registry

This document creates a new IANA Registry named "geo URI Parameters", according to the information in [Section 4](#) and the definition in this section.

[8.2.1.](#) Registry Contents

When registering a new 'geo' URI Parameter, the following information MUST be provided:

- o Name of the Parameter.
- o Whether the Parameter accepts no value ("No value"), values from a predefined set ("Predefined"), or values constrained by a syntax only ("Constrained").
- o Reference to the RFC or other permanent and readily available public specification defining the parameters and the new values.

When registering a new value for an existing 'geo' URI Parameter, the following information MUST be provided:

- o Name of the Parameter.
- o Reference to the RFC or other permanent and readily available public specification defining the new values.

The following table provides the initial values for this registry:

Parameter Name	Value Restriction	Reference(s)
crs	Predefined	[RFCxxxx]
u	Constrained	[RFCxxxx]

[Note to RFC Editor: Replace RFCxxxx with reference to this document]

[8.2.2.](#) Registration Policy

The Registration Policy for 'geo' URI Parameters and their value definitions shall be "Specification Required, Designated Expert", as defined in [\[RFC5226\]](#).

9. Security Considerations

Because the 'geo' URI is not tied to any specific protocol, and identifies a physical location rather than a network resource, most of the general security considerations on URIs (Section 7 of [RFC 3986](#)) do not apply. However, the following (additional) issues apply:

9.1. Invalid Locations

The URI syntax ([Section 3.3](#)) makes it possible to construct 'geo' URIs which don't identify a valid location. Applications MUST NOT use URIs with such values, and SHOULD warn the user when such URIs are encountered.

An example of such an URI referring to an invalid location would be <geo:94,0> (latitude "beyond" north pole).

9.2. Location Privacy

A 'geo' URI by itself is just an opaque reference to a physical location, expressed by a set of spatial coordinates. This does not fit the "Location Information" definition according to [Section 5.2](#) of GEOPRIV Requirements [[RFC3693](#)], because there is not necessarily a "Device" involved.

Because there is also no way to specify the identity of a "Target" within the confines of a 'geo' URI, it also does not fit the specification of an "Location Object" ([Section 5.2 of RFC3693](#)).

However, if a 'geo' URI is used in a context where it identifies the location of a Target, it becomes part of a Location Object and is therefore subject to GEOPRIV rules.

Therefore, when 'geo' URIs are put into such contexts, the privacy requirements of [RFC 3693](#) MUST be met.

10. Acknowledgements

Martin Thomson has provided significant text around the definition of

the "uncertainty" parameter and the GML mappings.

The authors further wish to acknowledge the helpful contributions from Carl Reed, Bill McQuillan, Martin Kofal, Andrew Turner, Kim Sanders, Ted Hardie, Cullen Jennings, Klaus Darilion, Bjorn Hoehrmann, Alissa Cooper and Ivan Shmakov.

11. References

11.1. Normative References

- [RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, [RFC 3986](#), January 2005.

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, [RFC 5234](#), January 2008.
- [RFC5491] Winterbottom, J., Thomson, M., and H. Tschofenig, "GEOPRIV Presence Information Data Format Location Object (PIDF-LO) Usage Clarification, Considerations, and Recommendations", [RFC 5491](#), March 2009.

11.2. Informative References

- [RFC4395] Hansen, T., Hardie, T., and L. Masinter, "Guidelines and Registration Procedures for New URI Schemes", [BCP 115](#), [RFC 4395](#), February 2006.
- [RFC5226] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 5226](#), May 2008.
- [RFC3693] Cuellar, J., Morris, J., Mulligan, D., Peterson, J., and J. Polk, "Geopriv Requirements", [RFC 3693](#), February 2004.
- [WGS84] National Imagery and Mapping Agency, "Department of Defense World Geodetic System 1984, Third Edition",

[Appendix A](#). Change Log

[Note to editors: This section is to be removed before publication - XML source available on request]

[draft-ietf-geopriv-geo-uri-03](#)

- o Updated privacy considerations section as per Alissa's comments
- o Added text on uncertainty applied to all given dimensions
- o various editorial changes
- o Changed ABNF to reflect order of parameters (CRS first, then U, then others)

[draft-ietf-geopriv-geo-uri-02](#)

- o Added IANA registry for 'geo' URI Parameters and values
- o Moved change log to appendix
- o Added "u" parameter to ABNF, restructured ABNF slightly
- o Added new section describing uncertainty

- o Changed mapping examples, added some for uncertainty
- o Added text that number of digits shouldn't be confused with uncertainty or accuracy
- o marked GML mappings as non-normative based on URI expert review advice
- o added internationalization consideration section
- o various other changes based on Expert Review

[draft-ietf-geopriv-geo-uri-01](#)

- o added parameters to ABNF
- o added optional 'crs' parameter to allow future use of other CRSes
- o Many other changes to not preclude the future specification of other CRSes.
- o some typos fixes - credits Bill McQuillan

[draft-ietf-geopriv-geo-uri-00](#)

- o submitted as WG item
- o changed IPR text because of text used from [RFC 4395](#)
- o added considerations for comparing +180/-180 longitude URIs

- o some editorial changes

[draft-mayrhofer-geopriv-geo-uri-01](#)

- o added terminology text about WGS-84 (credits Carl Reed)
- o removed "resolution" / "uncertainty" text
- o added considerations regarding poles
- o added text about invalid URIs

[draft-mayrhofer-geopriv-geo-uri-00](#)

- o Initial version under new name, reverting to "plain" lat/lon scheme, with the "tiling" scheme moved to separate draft (potentially published as "[draft-mayrhofer-geopriv-geotile-uri](#)"). refer to [draft-mayrhofer-geo-uri-01](#) for the history of this document.
- o Added GML mapping section

[draft-mayrhofer-geo-uri-01](#)

- o removed parameters

[draft-mayrhofer-geo-uri-00](#)

- o initial draft

Authors' Addresses

Alexander Mayrhofer
nic.at GmbH
Karlsplatz 1/2/9
Wien A-1010
Austria

Phone: +43 1 5056416 34
Email: alexander.mayrhofer@nic.at
URI: <http://www.nic.at/>

Christian Spanring
5 Crawford St
Cambridge 02139

Phone: +1 617 800 7885
Email: christian@spanring.eu
URI: <http://www.spanring.eu/>