         OSPF Extensions for Advertising/Signaling Geo Location Information
                    draft-acee-ospf-geo-location-05.txt

Abstract

   This document specifies an OSPF Router Information (RI) TLV to
   advertise the current Geo Coordinates of the OSPF router. For Point-
   to-Point (P2P)) and Point-to-Multi-Point (P2MP) networks, the Geo
   Coordinates can be used to dynamically computing the cost to
   neighbors. This is useful both from the standpoint of auto-
   configuration and situations where the OSPF routers are moving. The
   Geo Coordinates are also useful for other applications such as
   Traffic Engineering (TE) and network management.

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1. Introduction

   This document specifies an OSPF Router Information (RI) [OSPF-RI] TLV
   to advertise the current Geo Coordinates of the OSPF router. For
   Point-to-Point (P2P)) and Point-to-Multi-Point (P2MP) networks, the
   Geo Coordinates can be used to dynamically computing the cost to
   neighbors. This is useful both from the standpoint of auto-
   configuration and situations where the OSPF routers are moving. The
   Geo Coordinates are also useful for other applications such as
   Traffic Engineering (TE)and network management.

1.1. Requirements Notation

   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-KEYWORDS].

2. OSPF Geo Coordinates TLV

   The Geo Coordinates TLV can be used to advertise the current location
   of an OSPFv2 [OSPF] or OSPFv3 [OSPFV3] router using the OSPF Router
   Information LSA [OSPF-RI]. The OSPF Router Information LSA can be
   advertised in both link-scoped and area or AS scoped RI LSAs. The
   fields specify the location of the OSPF router using the WGS-84
   (World Geodetic System) reference coordinate system [WGS84]. The
   value of the Geo Coordinates TLV consists of the following fields:

```
    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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |U|N|E|A|M|R|K|   Reserved      |     Location Uncertainty      |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  Lat Degrees  |        Latitude Milliseconds                 |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | Long Degrees  |        Longitude Milliseconds                |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                            Altitude                          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |            Radius            |           Reserved            |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |         .. Optional Sub-TLVs
   +-+-+-+-+-+-+-+-+-....
```
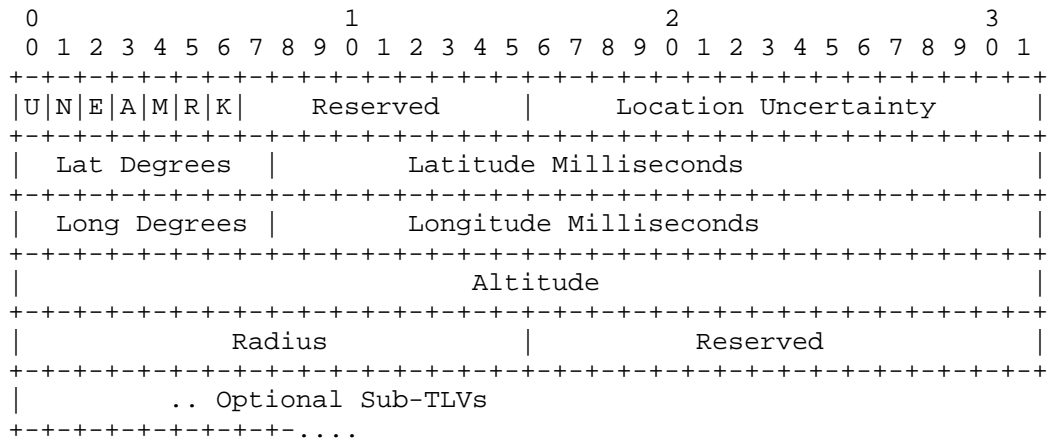
Where:

   U-bit: If the U-bit is set, it indicates that the "Location
          Uncertainty" field is specified. If the U-bit is clear,
          it indicates the "Location Uncertainty" field is
          unspecified.

   N-bit: If the N-bit is set, it indicates the Latitude is
          north relative to the Equator. If the N-bit is clear,
          it indicates the Latitude is south of the Equator.

   E-bit: If the E-bit is set, it indicates the Longitude is east
          of the Prime Meridian. If the E-bit is clear, it indicates
          the Longitude is west of the Prime Meridian.

   A-bit: If the A-bit is set, it indicates the "Altitude" field is
          specified. If the A-bit is clear, it indicates the
          "Altitude" field is unspecified.

   M-bit: If the M-bit is set, it indicates the "Altitude" is
          specified in meters. If the M-bit is clear, it indicates
          the "Altitude" is in centimeters.

   R-bit: If the R-bit is set, it indicates the "Radius" field is
          specified and the encoding is for a circular area. If
          the R-bit is clear, it indicates the "Radius" field is
          unspecified and the encoding is for a single point.

   K-bit: If the K-bit is set, it indicates the "Radius" is specified
          in kilometers. If the K-bit is clear, it indicates the
          "Radius" is in meters.

   Reserved: These bits are reserved. They SHOULD be set to 0 when
            sending protocol packets and MUST be ignored when
            receiving protocol packets.

   Location Uncertainty: Unsigned 16-bit integer indicating the
                        number of centimeters of uncertainty for
                        the location.

   Latitude Degrees: Unsigned 8-bit integer with a range of 0 - 90
                    degrees north or south of the Equator (northern
                    or southern hemisphere, respectively).

   Latitude Milliseconds: Unsigned 24-bit integer with a range of
                        0 - 3,599,999 (i.e., less than 60 minutes).

   Longitude Degrees: Unsigned 8-bit integer with a range of 0 - 180
                     degrees east or west of the Prime Meridian.

   Longitude Milliseconds: Unsigned 24-bit integer with a range of
                          0 - 3,599,999 (i.e., less than 60 minutes).

   Altitude: Signed 32-bit integer containing the Height relative to
            sea level in centimeters or meters. A negative height
            indicates that the location is below sea level.

   Radius: Unsigned 16-bit integer containing the radius of a
          circle centered at the specified coordinates. The radius
          is specified in meters unless the K-bit is specified
          indicating specification in kilometers. If the radius is
          specified, the geo-coordinates specify the entire area
          of the circle defined by the radius and center point.
          While the use cases herein do not make use of this field,
          future use cases may.

   Optional Sub-TLVs: No additional Sub-TLVs are defined in this
                     document.

                    OSPF Geo Coordinates TLV

3. Link Advertisement of the OSPF Geo-Coordinates

   When the Geo Coordinates are used for cost computation, the
   coordinates need to be advertised on the link using the encoding
   specified in Section 2. For this application, a link-scoped OSPF
   Router Information (RI) [OSPF-RI] is advertised on each link where
   geo-location cost computation is utilized.

When an OSPF router receives the Geo Coordinates TLV in a link-scoped
OSPF RI LSA from an adjacent neighbor, it can be used to calculate
the physical distance to neighbor. For P2P and P2MP networks, this
distance can be used to dynamically compute the cost of the link to
that neighbor. The mapping of the distance to advertised cost is not
specified in this document. However, all OSPF routers in the domain
SHOULD used the same algorithm. Computation of cost based on
physical distance can be useful both for autoconfiguration of these
networks types and dynamic cost computation when the routers are
moving.

The Geo location information can be statically provisioned or
dynamically acquired from a GPS capable device on the OSPF Router.

4. OSPFv2 Router Information (RI) Opaque LSA

The OSPF Geo Coordinates TLV may optionally be advertised in the OSPF
Router Information (RI) LSA [OSPF-RI]. It then may be used for
applications such as traffic engineering (TE) and network management
(e.g., the Find-My-Router application). The details of such
applications are beyond the scope of this document.

5. Security Considerations

Since the Geo Location coordinates provide the exact location of the
OSPF router, disclosure will make the OSPF router more susceptible to
physical attacks. In situations where this is a concern (e.g.,
military applications), confidentiality should be provided either
through a secure tunnel (e.g., [IP-ESP]) or protocol encryption
[OSPFV3-AUTH].

Additionally, in some situations, the topology of the network is
considered proprietary information. With the Geo Location
coordinates, the physical topology, as well as the IP topology, can
be discerned from the OSPF Router Information (RI) LSA. In these
situations, confidentiality should be assured.

Security considerations for the base OSPF protocol are covered in
[OSPF] and [OSPFV3].

6. Privacy Considerations

If the location of an OSPF router advertising geo location
coordinates as described herein can be directly correlated to an
individual, individuals, or an organization, the location of that
router should be considered sensitive and OSPF RI LSAs containing
such geo coordinates should be advertised confidentially as described
in Section 5. Additionally, OSPF network management facilities may

require added authorization to view the contents of OSPF RI LSAs containing geo-Location TLVs. Refer to [PRIVACY] for more information.

The Uncertainty and Confidence metrics for geo-location information as described in [GEO-PIDF-LO] are not included in the Geo Coordinates TLV. In a future document, these may be considered for inclusion with additional Geo Location Sub-TLVs dependent on both on requirements and adoption of [GEO-PIDF-LO].

7. IANA Considerations

The document will require the following IANA actions:

1. A Router Information TLV type for the Geo Location TLV will be allocated from the OSPF Router Information (RI) TLVs registry.

8. References

8.1. Normative References

[OSPF]   Moy, J., "OSPF Version 2", STD 54, RFC 2328, April 1998.

[OSPF-RI]   Lindem, A., Shen, N., Vasseur, J., Aggarwal, R., and S. Shaffer, "Extensions to OSPF for Advertising Optional Router Capabilities", RFC 7770, January 2016.

[OSPFV3]   Coltun, R., Ferguson, D., Moy, J., and A. Lindem, "OSPF for IPv6", RFC 5340, July 2008.

[RFC-KEYWORDS]
            Bradner, S., "Key words for use in RFC's to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

8.2. Informative References

[GEO-PIDF-LO]
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[LISP-GEO]
            Farinacci, D., "LISP Geo-Coordinate Use-Cases", draft-farinacci-lisp-geo-03 (work in progress), April 2017.

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              Gupta, M. and S. Melam, "Authentication/Confidentiality
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              Morris, J., Hansen, M., and R. Smith, "Privacy
              Considerations", RFC 6973, July 2013.

   [WGS84]   National Imagery and Mapping Agency, "Department of
              Defense World Geodetic System 1984, Third Edition", NIMA
              TR83500.2, January 2000.

Appendix A. Acknowledgments

   The RFC text was produced using Marshall Rose's xml2rfc tool.

   The encoding of the Geo location is adapted from "LISP Geo-
   Coordinates Use-Cases" [LISP-GEO]. We would like to thank the
   author, Dino Farinacci, for subsequent discussions.

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   encoding.

   The use-case for using OSPF to advertise the geo-location in OSPF was
   first mentioned in an OSPF operator-defined TLV draft by Uma
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   Jalil.

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