                    IANA Considerations for OSPF

Status of This Memo

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Abstract

   This memo creates a number of OSPF registries and provides guidance
   to IANA for assignment of code points within these registries.

Table of Contents

1. Introduction

   This memo defines various OSPF registries for IANA to set up and
   maintain for OSPF code points. In some cases, this memo defines
   ranges of code point values within these registries; each such range
   has a different assignment policy.

   The terms used in describing the assignment policies are as follows:

      o Standards Action

      o Experimentation

      o Vendor Private Use

      o Reserved

   Standards Action means that assignments in that range MUST only be
   made for Standards Track RFCs (as defined in [RFC2434]).

   Some of the registries defined below reserve a range of values for
   Experimentation. For guidelines regarding the use of such values see
   [RFC3692]. Values from this range MUST NOT be assigned by IANA.
   Further guidance on the use of the Experimentation range may be found
   in paragraphs 4, 5, and 6 of [RFC3692]. An implementation MAY choose
   to not support values from the Experimentation range. In such a
   case, the protocol data structure with a code point from the
   Experimentation range is ignored, unless other protocol machinery
   says how to deal with it. "Ignored" in this context means that the
   associated data structure is removed from the received packet before
   further processing, including flooding.

   Values set aside as Vendor Private Use MUST NOT be assigned by IANA.
   A protocol data structure whose code point falls in this range MUST
   have a disambiguating field identifying the Vendor. This identifier
   consists of four octets of the Vendor's SMI (Structure of Management
   Information) enterprise code (see [ENTERPRISE-NUMBERS]) in network
   byte order; the location of this code must be well-defined per data
   structure. An implementation that encounters a Vendor Private code
   point SHOULD check whether the enterprise code is one that it
   recognizes; if so, the implementation MAY choose to interpret the
   code point and data structure. Otherwise, it SHOULD ignore the code
   point, unless the protocol machinery says how to deal with the data
   structure (as defined in the previous paragraph). This allows
   multiple vendor private extensions to coexist in a network.

   Values in the Reserved range MUST NOT be assigned until a Standards
   Track or Best Common Practices RFC is published defining the

assignment policy for that range. This RFC MUST be the product of
the OSPF Working Group; if the OSPF WG is terminated, then it MUST be
reviewed by an Expert Reviewer designated by the IESG.

1.1. Conventions Used in This Document

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].

2. OSPF Registries

This section lists the various registries for OSPF protocol code
points. Note that some of these are for OSPF, and some are specific
to a particular version of OSPF; also, some registries predate this
memo.

Registries that are specific to one version of OSPF reflect the
version number in the registry name (e.g., OSPFv2 Options). A
registry whose name does not mention a version number applies to both
OSPFv2 and OSPFv3 (e.g., OSPF Packet Type).

2.1. OSPFv2 Options

(Defined in Section A.2 of [RFC2328], updated in Section A.1 of
[RFC2370]. See also [RFC3101].)

Assignment policy: Standards Action.

2.2. OSPFv3 Options

(Defined in Section A.2 of [RFC2740])

Assignment policy: Standards Action.

2.3. OSPF Packet Type (Both v2 and v3)

(Defined in Section A.3.1 of [RFC2328])

```
+---------+---------------------+
| Range   | Assignment Policy   |
+---------+---------------------+
| 0       | Not to be assigned  |
| 1-5     | Already assigned    |
| 6-127   | Standards Action    |
| 128-255 | Reserved            |
+---------+---------------------+
```

2.3.1. OSPF Authentication Type

   (Defined in Section A.3.1 of [RFC2328])

   (Note: this registry is called "OSPF AUTHENTICATION CODES" by IANA.)

```
            +-------------+--------------------+
            | Range       | Assignment Policy  |
            +-------------+--------------------+
            | 0-2         | Already assigned   |
            | 3-247       | Standards Action   |
            | 248-65519   | Reserved           |
            | 65520-65535 | Experimentation    |
            +-------------+--------------------+
```

2.4. OSPFv2 Link State (LS) Type

   (Defined in Section A.4.1 of [RFC2328])

```
            +---------+--------------------+
            | Range   | Assignment Policy  |
            +---------+--------------------+
            | 0       | Not to be assigned |
            | 1-11    | Already assigned   |
            | 12-127  | Standards Action   |
            | 128-255 | Reserved           |
            +---------+--------------------+
```

   If a new LS Type is documented, the documentation MUST say how the
   Link State ID is to be filled in, what the flooding scope of the LSA
   (Link State Advertisement) is, and how backward compatibility is
   maintained.

2.4.1. OSPFv2 Router LSA Link Type

   (Defined in Section A.4.2 of [RFC2328])

```
            +---------+--------------------+
            | Range   | Assignment Policy  |
            +---------+--------------------+
            | 0       | Not to be assigned |
            | 1-4     | Already assigned   |
            | 5-127   | Standards Action   |
            | 128-255 | Reserved           |
            +---------+--------------------+
```

   There is no range for Vendor Private Use, as there is no space for an
   enterprise code to identify the Vendor.

No Experimental range is defined, due to possible backwards
compatibility issues.

If a new Router LSA Link Type is documented, the documentation SHOULD
say how the Link State ID, Link ID, and Link Data fields are to be
filled in, and how backward compatibility is maintained.

2.4.2. OSPFv2 Router Properties

(Defined in Section A.4.2 of [RFC2328], updated in [RFC3101])

This 8-bit field in the Router LSA is unnamed; it is the field
immediately following the Router LSA length.

Assignment policy: Standards Action.

2.5. OSPFv3 LSA Function Code

This registry is created by [OSPF-CAP]. This document provides the
values to be populated for values defined in Section A.4.2.1 of
[RFC2740].

2.5.1. OSPFv3 Prefix Options

(Defined in Section A.4.1.1 of [RFC2740])

Assignment policy: Standards Action.

2.5.2. OSPFv3 Router LSA Link Type

(Defined in Section A.4.3 of [RFC2740])

Range	Assignment Policy
0	Not to be assigned
1-4	Already assigned
5-127	Standards Action
128-255	Reserved

There is no range for Vendor Private Use, as there is no space for an
enterprise code to identify the Vendor.

No Experimental range is defined, due to possible backwards
compatibility issues.

2.6. OSPFv2 Opaque LSA Type

(Defined in Section A.2 of [RFC2370])

(Note: this registry is called "OSPF Opaque LSA Option" by IANA. See also [RFC3630].)

Range	Assignment Policy
0	Not to be assigned
1-3	Already assigned
4-127	Standards Action
128-247	Reserved
248-251	Experimentation
252-255	Vendor Private Use

In an OSPFv2 Opaque LSA with Opaque LSA Type in the Vendor Private Use range, the first four octets of Opaque Information MUST be the Vendor enterprise code.

A document defining a new Standards Track Opaque LSA with TLVs and sub-TLVs MUST describe ranges and assignment policies for these TLVs.

2.6.1. OSPFv2 Grace LSA Top Level TLVs

(Defined in Appendix A of [RFC3623])

Range	Assignment Policy
0	Not to be assigned
1-3	Already assigned
4-255	Standards Action
256-65519	Reserved
65520-65527	Experimentation
65528-65535	Vendor Private Use

In a Grace LSA, if a top-level TLV has a Type from the Vendor Private Use range, the Length MUST be at least four, and the first four octets of the Value field MUST be the Vendor enterprise code.

3. Acknowledgments

    Many thanks to Adrian Farrel and Acee Lindem for their review and
    comments.

4. Security Considerations

    The lack of adequate IANA guidelines may be viewed as an avenue for
    Denial of Service attacks on IETF protocols (in this case, OSPFv2 and
    OSPFv3), and on the IETF Standards Process in general. This memo
    attempts to close this loophole for OSPFv2 and OSPFv3.

    Authors contemplating extensions to OSPF SHOULD examine such
    extensions carefully, and consider whether new registries are needed,
    and if so, allocation policies within each registry.

5. IANA Considerations

    This document specifies assignment policy for several existing IANA
    registries and creates several more.

5.1. OSPFv2 Options Registry

    Section 2.1 defines the policy for allocation of bits from this
    registry as "Standards Action". There are only 8 bits in this field,
    and 6 are already assigned. The initial registry contents are given
    below.

    OSPFv2 Options Registry (Section 2.1)

    Value Description Reference
    ----- ----------- ---------
    0x02 E-bit   [RFC2328]
    0x04 MC-bit   [RFC1584]
    0x08 N/P-bit   [RFC3101]
    0x10 Reserved
    0x20 DC-bit   [RFC1793]
    0x40 O-bit   [RFC2370]

5.2. OSPFv3 Options Registry

    Section 2.2 defines the policy for allocation of bits from this
    registry as "Standards Action". There are 24 bits in this field, and
    6 are assigned. The initial registry contents are given below.

OSPFv3 Options Registry (Section 2.2)

Value	Description	Reference
0x000001	V6-bit	[RFC2740]
0x000002	E-bit	[RFC2328]
0x000004	MC-bit	[RFC1584]
0x000008	N-bit	[RFC3101]
0x000010	R-Bit	[RFC2740]
0x000020	DC-bit	[RFC1793]

5.3. OSPF Packet Type Registry

Section 2.3 defines the policy for allocation of values from this registry for different ranges. The initial registry contents are given below.

OSPF Packet Type (Section 2.3)

Value	Description	Reference
1	Hello	[RFC2328]
2	Database Description	[RFC2328]
3	Link State Request	[RFC2328]
4	Link State Update	[RFC2328]
5	Link State Ack	[RFC2328]

5.4. OSPF Authentication Type Registry

This registry already exists at IANA, called "ospf-authentication-codes". Section 2.3.1 defines the policy for allocation from this registry for different ranges.

5.5. OSPFv2 Link State Type Registry

Section 2.4 defines the policy for allocations from this registry for different ranges. The initial registry contents are given below.

OSPFv2 Link State (LS) Type (Section 2.4)

Value	Description	Reference
1	Router-LSA	[RFC2328]
2	Network-LSA	[RFC2328]
3	Summary-LSA (IP network)	[RFC2328]
4	Summary-LSA (ASBR)	[RFC2328]
5	AS-external-LSA	[RFC2328]
6	Group-membership-LSA	[RFC1584]
7	NSSA AS-external LSA	[RFC3101]
8	Reserved	
9	Link-local Opaque LSA	[RFC2370]
10	Area-local Opaque LSA	[RFC2370]
11	Opaque LSA	[RFC2370]

5.6. OSPFv2 Router LSA Link Type Registry

   Section 2.4.1 defines the policy for allocations from this registry
   for different ranges. The initial registry contents are given below.

   OSPFv2 Router LSA Link Type (Section 2.4.1)

Value	Description	Reference
1	Point-to-Point connection to another router	[RFC2328]
2	Transit Network	[RFC2328]
3	Stub Network	[RFC2328]
4	Virtual Link	[RFC2328]

5.7. OSPFv2 Router Properties Registry

   Section 2.4.2 defines the policy for allocation of bits from this
   registry as "Standards Action". There are only 8 bits in this field,
   and 5 are already assigned. The initial registry contents are given
   below.

   OSPFv2 Options Registry (Section 2.1)

Value	Description	Reference
0x01	B-bit	[RFC2328]
0x02	W-bit	[RFC2328]
0x04	V-bit	[RFC2328]
0x08	W-bit	[RFC1584]
0x10	Nt-bit	[RFC3101]

5.8. OSPFv3 LSA Function Code Registry

   This registry is created by [OSPF-CAP], which also defines the
   registration policy. This section contains values that belong in
   this registry that were defined by [RFC2740].

   As defined in [RFC2740], the first 3 bits of the LSA Function
   Code are the U, S1, and S2 bits. A given function code implies a
   specific setting for the U, S1, and S2 bits as shown in the "LS Type"
   column.

```
                                  1  1  1  1  1  1
          0  1  2  3  4  5  6  7  8  9  0  1  2  3  4  5
         +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
         |U |S2|S1|            LSA Function Code         |
         +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
```

   The U bit indicates how the LSA should be handled by a router which
   does not recognize the LSA's function code. Its values are:

   U-bit LSA Handling
   ----- ---
   0   Treat the LSA as if it had link-local flooding scope
   1   Store and flood the LSA, as if type understood

   The S1 and S2 bits indicate the flooding scope of the LSA. The
   values are:

   S1 S2 Flooding Scope
   -- -- --
   0 0 Link-Local Scoping. Flooded only on link it is originated on
   0 1 Area Scoping. Flooded to all routers in the originating area
   1 0 AS Scoping. Flooded to all routers in the AS
   1 1 Reserved

   The initial registry contents are given below.

   OSPFv3 LSA Function Code (Section 2.5)

LSA Function Code	LS Type	Description	Reference
1	0x2001	Router-LSA	[RFC2740]
2	0x2002	Network-LSA	[RFC2740]
3	0x2003	Inter-Area-Prefix-LSA	[RFC2740]
4	0x2004	Inter-Area-Router-LSA	[RFC2740]
5	0x4005	AS-External-LSA	[RFC2740]
6	0x2006	Group-membership-LSA	[RFC2740]
7	0x2007	Type-7-LSA	[RFC2740]
8	0x0008	Link-LSA	[RFC2740]
9	0x2009	Intra-Area-Prefix-LSA	[RFC2740]

5.9. OSPFv3 Prefix Options Registry

   Section 2.5.1 defines the policy for allocation of bits from this
   registry as "Standards Action". There are only 8 bits in this field,
   and 4 are already assigned. The initial registry contents are given
   below.

   OSPFv3 Prefix Options Registry (Section 2.5.1)

Value	Description	Reference
0x01	NU-bit	[RFC2740]
0x02	LA-bit	[RFC2740]
0x04	MC-bit	[RFC2740]
0x08	P-bit	[RFC2740]

5.10. OSPFv3 Router LSA Link Type Registry

   Section 2.5.2 defines the policy for allocations from this registry
   for different ranges. The initial registry contents are given below.

   OSPFv3 Router LSA Link Type (Section 2.5.2)

Value	Description	Reference
1	Point-to-Point connection to another router	[RFC2740]
2	Transit Network	[RFC2740]
3	Reserved	[RFC2740]
4	Virtual Link	[RFC2740]

5.11. OSPFv2 Opaque LSA Type Registry

This registry already exists at IANA, called "ospf-opaque-types".
Section 2.6 defines the policy for allocation from this registry for
different ranges.

5.12. OSPFv2 Grace LSA Top Level TLV Registry

Section 2.6.1 defines the policy for allocations from this registry
for different ranges. The initial registry contents are given below.

OSPFv2 Grace LSA Top Level TLV (Section 2.6.1)

Value	Description	Reference
1	Grace Period	[RFC3623]
2	Graceful Restart reason	[RFC3623]
3	IP Interface Address	[RFC3623]

6. References

6.1. Normative References

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[RFC2370] Coltun, R., "The OSPF Opaque LSA Option", RFC 2370, July
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6.2. Informative References

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              "PRIVATE ENTERPRISE NUMBERS",
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