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Optimized Link State Routing Protocol version 2 (OLSRv2) and MANET Neighborhood Discovery Protocol (NHDP) Extension TLVs
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Abstract

This specification describes extensions to definitions of TLVs used by the Optimized Link State Routing Protocol version 2 (OLSRv2) and the MANET Neighborhood Discovery Protocol (NHDP), to increase their abilities to accommodate protocol extensions. This document updates OLSRv2 and RFC6130.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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Table of Contents

1. Introduction

The MANET Neighborhood Discovery Protocol (NHDP) [RFC6130] and the Optimized Link State Routing Protocol, version 2 (OLSRv2) [OLSRv2] are protocols for use in mobile ad hoc networks (MANETs) [RFC2501], based on the Generalized Mobile Ad Hoc Network (MANET) Packet/Message Format [RFC5444].

This document updates [RFC6130] and [OLSRv2], specifically their use of TLV (Type-Length-Value) elements, to increase the extensibility of these protocols, and to enable some improvements in their implementation.

This specification reduces the latitude of implementations of [OLSRv2] and [RFC6130] to consider some messages, which will not be created by implementations simply following those specifications, as a reason to consider the message as "badly formed", and thus as a reason to reject the message. This gives greater latitude to the creation of extensions of these protocols, in particular extensions that will interoperate with unextended implementations of those protocols. As part of that, it indicates how TLVs (Type-Length-Value elements) [RFC5444] with unexpected value fields must be handled, and adds some additional options to those TLVs.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

Additionally, this document uses the terminology of [RFC5444], [RFC6130], and [OLSRv2].

3. Applicability Statement

This document updates the specification of the protocols [OLSRv2] and [RFC6130]. As such it is applicable to all implementations of these protocols.

Specifically, this specification updates [RFC6130] and [OLSRv2] in the following way:

- Removes the latitude of rejecting a message with a TLV with a known type, but with an unexpected TLV Value field, for the TLV Types defined in [RFC6130] and [OLSRv2].

- Specifies the handling of a TLV Value field with unexpected length.

- Sets up IANA registries for TLV Values for the Address Block TLVs:

  - LOCAL_IF, defined in [RFC6130].

  - LINK_STATUS, defined in [RFC6130].

  - OTHER_NEIGHB, defined in [RFC6130].

  - MPR, defined in [OLSRv2], now considered as a bit field.

  - NBR_ADDR_TYPE, defined in [OLSRv2], now considered as a bit field.

- Defines a well-known TLV Value for "UNSPECIFIED" for the Address Block TLV Types LOCAL_IF, LINK_STATUS, and OTHER_NEIGHB, all defined in [RFC6130].

4. TLV Values

NHDP [RFC6130] and OLSRv2 [OLSRv2] define a number of TLVs within the framework of [RFC5444]. These TLVs define the meaning of only some of the contents that can be found in a TLV Value field. This limitation may be either only defining certain TLV Values, or considering only some lengths of the TLV Value fields (or single value field in a multi value Address-Block TLV). This specification describes how NHDP [RFC6130] and OLSRv2 [OLSRv2] SHOULD handle TLVs with other TLV Value fields.

4.1. Unrecognized TLV Values

NHDP and OLSRv2 specify that, in addition to well-defined reasons (in the respective protocol specifications), an implementation of these protocols MAY recognize a message as "badly formed" and therefore "invalid for processing" for other reasons (Section 12.1 of [RFC6130] and Section 16.3.1 of [OLSRv2]). These sections could be interpreted as allowing rejection of a message because a TLV Value field is unrecognized. This specification removes that latitude:

- An implementation MUST NOT reject a message because it contains such a TLV. Instead, any unrecognised TLV Value field MUST be processed or ignored by an unextended implementation of NHDP or OLSRv2, as described in the following sections.

It should be stressed that this is not a change to [RFC6130] or

[OLSRv2], except with regard to not allowing this to be a reason for rejection of a message. [RFC6130] or [OLSRv2] are specified in terms such as "if an address is associated with a value of LOST by a LINK_STATUS TLV". Association with an unrecognized value has no effect on any implementation strictly following such a specification.

4.2. TLV Value Lengths

The TLVs specified in [RFC6130] and [OLSRv2] may be either single-value or multi-value TLVs. In either case, the length of each item of information encoded in the TLV Value field is the "single-length", defined and calculated as in section 5.4.1 in [RFC5444]. All TLVs specified in [RFC6130] and [OLSRv2] have a one or two octet single-length. These are considered the expected single-lengths of such a received TLV.

Other single-length TLV Value fields may be introduced by extensions to [RFC6130] and [OLSRv2]. This document specifies how implementations of [RFC6130] and [OLSRv2], or extensions thereof, MUST behave on receiving TLVs of the TLV types defined in [RFC6130] and [OLSRv2], but with TLV Value fields with other single-length values.

The following principles apply:

- If the received single-length is greater than the expected single-length, then the excess octets MUST be ignored.

- If the received single-length is less than the expected single-length, then the absent octets MUST considered to have all bits cleared (0).

Exceptions:

- A received CONT_SEQ_NUM with a single-length < 2 SHOULD be considered an error.

4.3. Undefined TLV Values

[RFC6130] and [OLSRv2] define a number of TLVs, but for some of these TLVs specify meanings for only some TLV Values. This document establishes IANA registries for these TLV Values, with initial registrations reflecting those used by [RFC6130] and [OLSRv2], and as specified in Section 4.3.3.

There are different cases of TLV Values with different characteristics. These cases are considered in this section.

4.3.1. NHDP TLVs: LOCAL_IF, LINK_STATUS and OTHER_NEIGHB

For the Address-Block TLVs LOCAL_IF, LINK_STAUS and OTHER_NEIGHB TLVs, defined in [RFC6130], only a limited number of values are specified for each. These are converted, by this specification, into extensible registries with initial registrations for values defined and used by [RFC6130] - see Section 5.

An implementation of [RFC6130], receiving a TLV with any TLV Value other than those values used in that specification, MUST ignore that TLV Value and any corresponding attribute association to the address.

4.3.2. OLSRv2 TLVs: MPR and NBR_ADDR_TYPE

The Address-Block TLVs MPR and NBR_ADDR_TYPE, defined in [OLSRv2], are similar to those defined in [RFC6130] in having only limited values specified (1, 2 and 3): 1 and 2, represent presence of two different attributes associated to an address, and 3 represents "both 1 and 2".

These TLV Value fields, are by this specification, converted to bit fields, and MUST be interpreted as such. As the existing definitions of values 1, 2, and 3 behave in that manner, it is likely that this will involve no change to an implementation, but any test of (for example) Value = 1 or Value = 3 MUST be converted to a test of (for example) Value bitand 1 = 1, where "bitand" denotes a bitwise and operation.

This specification creates registries for recording reservations of the individual bits in these bitfields, with initial registrations for values defined and used by [OLSRv2] - see Section 5.

Other TLVs defined by [OLSRv2] are not affected by this specification.

4.3.3. Unspecified TLV Values

The registries defined in Section 5 for the LOCAL_IF, LINK_STATUS and OTHER_NEIGHB TLVs each include an additional TLV Value UNSPECIFIED. This TLV Value represents a defined value that, like currently undefined TLV Values, indicates that no information is associated with this address, but will always have this meaning. Such a TLV Value may be used to enable the creation of more efficient multivalue Address Block TLVs, or to simplify an implementation.

The similar requirement for the MPR and NBR_ADDR_TYPES TLVs is already satisfied by the TLV Value zero, provided that each bit in the TLV Value is defined as set ('1') when indicating the presence of

an attribute, or clear ('0') when indicating the absence of an attribute; this is therefore required for registrations from the relevant registries, see Section 5.

For the LINK_METRIC TLV, this is already possible by clearing the most significant bits (0 to 3) of the first octet of the TLV Value. It is RECOMMENDED that in this case the remaining bits of the TLV Value are either all clear ('0') or all set ('1').

5. IANA Considerations

Note: Values defined as "Unallocated: Expert Review" mean that these values may be allocated according to the expert review guidelines specified in [RFC6130] and [OLSRv2]. In two cases a constraint on future allocation is specified. IANA tables referenced are from "Mobile Ad hoc NETwork (MANET) Parameters".

5.1. Address Block TLVs

IANA is requested to create a registry associated with the Address Block TLV with name LOCAL_IF (Type = 2, Type Extension = 0) defined in [RFC6130], specifying the meaning of its single values. This replaces the Description column in IANA table "LOCAL_IF Address Block TLV Type Extensions" (from Table 6 in [RFC6130]) by a reference to this table.

Value	Name	Description
0	THIS_IF	The network address is associated with this local interface of the sending router
1	OTHER_IF	The network address is associated with another local interface of the sending router
2-223		Unallocated: Expert Review
224-254		Experimental Use
255	UNSPECIFIED	No information about this network address is provided

Table 1: LOCAL_IF TLV Values

IANA are requested to create a registry associated with the Address Block TLV with name LINK_STATUS (Type = 3, Type Extension = 0) defined in [RFC6130], specifying the meaning of its single values. This replaces the Description column in the IANA table "LINK_STATUS

Address Block TLV Type Extensions" (from Table 7 in [RFC6130]) by a reference to this table.

Value	Name	Description
0	LOST	The link on this interface from the router with that network address has been lost
1	SYMMETRIC	The link on this interface from the router with that network address has the status of symmetric
2	HEARD	The link on this interface from the router with that network address has the status of heard
3-223		Unallocated: Expert Review
224-254		Experimental Use
255	UNSPECIFIED	No information about this network address is provided

Table 2: LINK_STATUS TLV Values

IANA are requested to create a registry associated with the Address Block TLV with name OTHER_NEIGHB (Type = 4, Type Extension = 0) defined in [RFC6130], specifying the meaning of its single values. This replaces the Description column in Table 8 in the IANA table "OTHER_NEIGHB Address Block TLV Type Extensions" (from [RFC6130]) by a reference to this table.

Value	Name	Description
0	LOST	The neighbor relationship with the router with that network address has been lost
1	SYMMETRIC	The neighbor relationship with the router with that network address is symmetric
2-223		Unallocated: Expert Review
224-254		Experimental Use
255	UNSPECIFIED	No information about this network address is provided

Table 3: OTHER_NEIGHB TLV Values

IANA are requested to create a registry associated with the Address Block TLV with name MPR (Type = 8, Type Extension = 0) defined in [OLSRv2], specifying the meaning of its single values in terms of the

values of each bit of the value, from bit 0 (most significant) to bit 7 (least significant). If multiple bits are set then each applies. This replaces the Description column in the (not yet created) IANA table "MPR Address Block TLV Type Extensions" (from Table 14 in [OLSRv2]) by a reference to this table.

Value Bit	Value	Name	Description
7	1	FLOODING	The neighbor with that network address has been selected as flooding MPR
6	2	ROUTING	The neighbor with that network address has been selected as flooding MPR
0-5			Unallocated: Expert Review

Table 4: MPR TLV Bit Values

Note that this registry maintains a bit field, and that the combination of the bits FLOODING + ROUTING being set (1) (which gives a value of 3) is given the name FLOOD_ROUTE in [OLSRv2]. For all future allocations, the Expert Review MUST ensure that allocated bits MUST use the unset bit (0) to indicates no information, so that the case Value = 0 will always indicate that no information about this network address is provided.

IANA are requested to create a registry associated with the Address Block TLV with name NBR_ADDR_TYPE (Type = 9, Type Extension = 0) defined in [OLSRv2], specifying the meaning of its single values in terms of the values of each bit of the value, from bit 0 (most significant) to bit 7 (least significant). If multiple bits are set then each applies. This replaces the Description column in the (not yet created) IANA table "NBR_ADDR_TYPE Address Block TLV Type Extensions" (from Table 15 in [OLSRv2]) by a reference to this table.

Value Bit	Value	Name	Description
7	1	ORIGINATOR	The network address is an originator address reachable via the originating router
6	2	ROUTABLE	The network address is a routable address reachable via the originating router
0-5			Unallocated: Expert Review

Table 5: NBR_ADDR_TYPE TLV Bit Values

Note that this registry maintains a bit field, and that the combination of the bits ORIGINATOR + ROUTABLE being set (1) (which gives a value of 3) is given the name ROUTABLE_ORIG in [OLSRv2]. For all future allocations, the Expert Review MUST ensure that allocated bits MUST use the unset bit (0) to indicates no information, so that the case Value = 0 will always indicate that no information about this network address is provided.

6. Security Considerations

The presented updates to [RFC6130] and [OLSRv2]:

- Create IANA registries for retaining TLV values for TLVs, already defined in the already published specifications of the two protocols, and with initial registrations for the TLV values defined by these specifications. This does not give rise to any additional security considerations.

- Enable protocol extensions to be able to register TLV values in the created IANA registries. Such extensions MUST specify appropriate security considerations.

- Create, in some registries, a registration for "UNSPECIFIED" values, for more efficient use of multi-value Address Block TLVs. The interpretation of an address being associated with a TLV of a given type and with the value "UNSPECIFIED" is identical to that address not being associated with a TLV of that type. Thus, this update does not give rise to any additional security considerations.

- Reduces the latitude of implementations of the two protocols to reject a message as "badly formed", due to the value field of a TLV being unexpected. These protocols are specified in terms such as "if an address is associated with a value of LOST by a LINK_STATUS TLV". Association with an unknown value (or a value newly defined to mean no link status information) has no effect on such a specification. Thus, this update does not give rise to any additional security considerations.

- Do not introduce any opportunities for attacks on the protocols through signal modification that are not already present in the two protocols.

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8. References

8.1. Normative References

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8.2. Informative References

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