DLEP Radio Quality Extension

Abstract

   This document defines an extension to the Dynamic Link Exchange
   Protocol (DLEP) to provide the quality of incoming radio signals.

Status of This Memo

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1. Introduction

The dynamic Link Exchange Protocol (DLEP) is defined in [RFC8175].
It provides the exchange of link-related control information between
DLEP peers. DLEP peers are comprised of a modem and a router. DLEP
defines a base set of mechanisms as well as support for possible
extensions. This document defines one such extension.

1.1. Requirements Language

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 [RFC2119].

2. Extension Usage and Identification

The use of the Radio Quality Extension SHOULD be configurable. To
indicate that the Radio Quality Extension is to be used, an
implementation MUST include the Radio Quality Extension Type Value
in the Extensions Supported Data Item. The Extensions Supported Data
Item is sent and processed according to [RFC8175].

The Radio Quality Extension Type Value is TBD; see Section TBD.

3. Radio Quality Data Items

This section describes the quality related Data Items of this
extension.

All Data Items available in this extension provide access to the
radios physical layer measurements related to signal quality.
Because of different designs of Radio PHY layers, this quality can

be expressed in different ways, by referring to signal-to-noise
ratio or by measuring the biterror rate (e.g. by using a forward
error correction). Both of these possible informations are very
valuable for calculating MANET metrics for radio networks with
moving nodes and low datarates, e.g. VHF radio networks. Estimating
channel quality based on packet loss can be impractical, because the
estimated value changes too fast (because of movement) compared to
the number of received frames. Signal Strength (or Biterror rate)
can provice the additional information necessary to build a
reasonable stable and agile metric.

3.1. Radio SNR Data Item

Radio SNR Data Item contains information which signal to noise ratio
the radio measured. This Data Item can be both interface and
neighbor specific.

The format of the Radio SNR Data Item is:

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Data Item Type                | Length                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|               SNR             |      Flags    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

                          Figure 1

Data Item Type: TBD

Length: 3

SNR: SNR measured in dB multiplied by 10 as a signed integer.

Flags: Flags field as defined below.

The Flags field is defined as:

```
0 1 2 3 4 5 6 7
+-+-+-+-+-+-+-+-+
|   Reserved  |I|
+-+-+-+-+-+-+-+-+
```
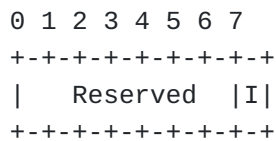
                          Figure 2

I: Interference Flag, indicating the the data includes interference
     into the noise value (SINR).

Reserved: MUST be zero. Left for future assignment.

3.2. Radio Signal Strength Data Item (also called RSSI)

Radio Signal Strength Data Item contains information which absolute
signal strength the radio measured. This Data Item can be both
interface and neighbor specific.

This Data Item could also be used together with the Request Link
Characteristics message to reconfigure the outgoing signal strength,
either to reduce the size of the collision domain or to increase the
range of the radio.

The format of the Radio Signal Strength Data Item is:

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Data Item Type               | Length                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Signal           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 3

Data Item Type: TBD

Length: 2

Signal: Signal Strength measured in dBm multiplied by 10 as a
   signed integer.

3.3. Radio Biterror Rate Data Item

Radio Biterror Rate Data Item contains information which absolute
noise value the radio measured. This Data Item can be both interface
and neighbor specific.

The format of the Radio Biterror Rate Data Item is:
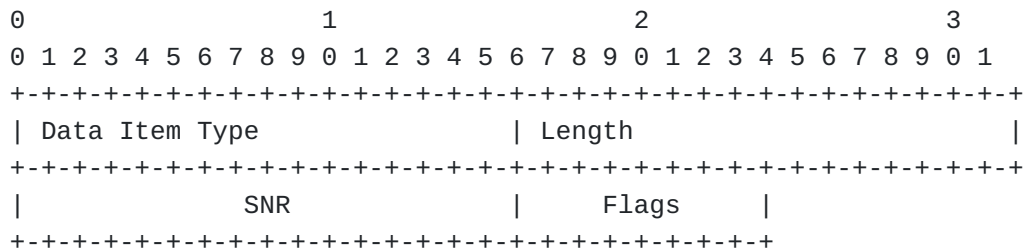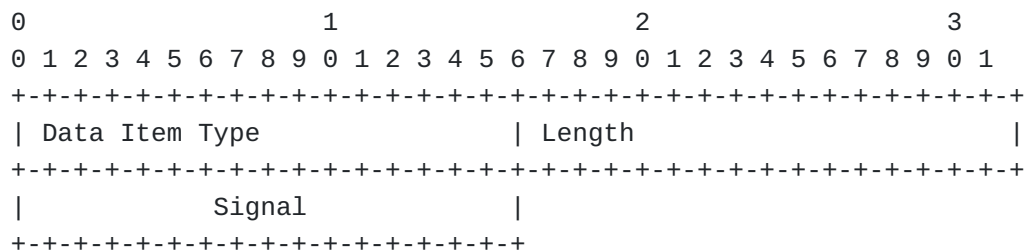
```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Data Item Type               | Length                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Biterror   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
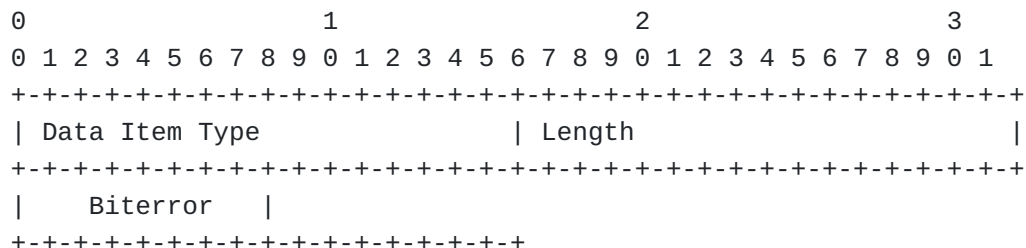
Figure 4

Data Item Type: TBD

Length:
      1

Biterror: Biterror rate measured as a negative exponent to base 10,
      e.g. "4" for an error rate of 1 to 10^-4. An error rate of 0 is
      encoded with a 255.

3.4. Radio Noise Data Item

Radio Noise Data Item contains information which absolute noise
value the radio measured. This Data Item SHOULD be interface
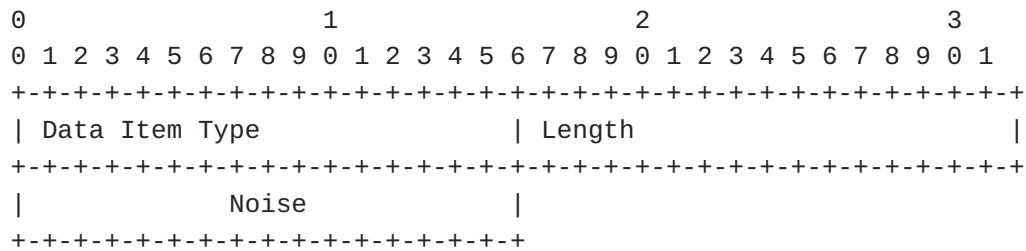specific.

The format of the Radio Noise Data Item is:

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Data Item Type                | Length                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Noise             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 5

Data Item Type: TBD

Length: 2

Noise: Noise measured in dBm multiplied by 10 as a signed integer.

4. Security Considerations

The extension introduces a new Data Item for DLEP. The extension
does not inherently introduce any additional vulnerabilities above
those documented in [RFC8175]. The approach taken to security in
that document applies equally when running the extension defined in
this document.

5. IANA Considerations

As described below, IANA has assigned two values per this document.
Both assignments are to registries defined by [RFC8175].

5.1. Extension Type Value

IANA has assigned the following value in the "Extension Type Values"
registry within the "Dynamic Link Exchange Protocol (DLEP)
Parameters" registry. The new value is in the range with the
"Specification Required" [RFC8126] policy:

Code	Description
TBD	Radio Quality

Table 1: New
Extension Type Value

5.2. Data Item Value

IANA has assigned the following value in the "Data Item Type Values" registry within the "Dynamic Link Exchange Protocol (DLEP) Parameters" registry. The new value is in the range with the "Specification Required" [RFC8126] policy:

Type Code	Description
TBD	Radio SNR
TBD	Radio Signal
TBD	Radio Biterror Rate
TBD	Radio Noise

Table 2: New Data Item Value

6. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8175] Ratliff, S., Jury, S., Satterwhite, D., Taylor, R., and B. Berry, "Dynamic Link Exchange Protocol (DLEP)", RFC 8175, DOI 10.17487/RFC8175, June 2017, <https://www.rfc-editor.org/info/rfc8175>.

7. Informative References

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <https://www.rfc-editor.org/info/rfc8126>.

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