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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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This Internet-Draft will expire on 24 January 2024.

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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. In this usecase Biterror rate is normally the preffered way (compared to signal-to-noise ratio) because its easier to compare between different types of radio waveforms.

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:

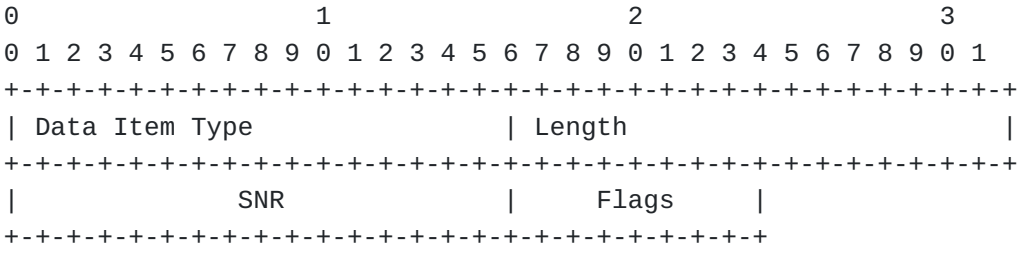

Figure 1

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:

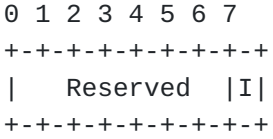

Figure 2

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:

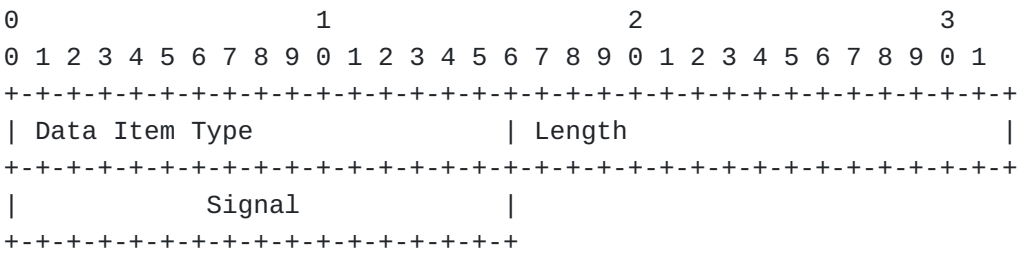

Figure 3

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 about the radio receivers estimate how often a transmitted bit will be received wrong. This value can often be either directly measured by the radio by comparing the result of a forward-error-correction to the original received data or calculated from the received signal-to-noise ratio and knowledge about the current modulation coding scheme. This Data Item can be both interface and neighbor specific.

The format of the Radio Biterror Rate Data Item is:

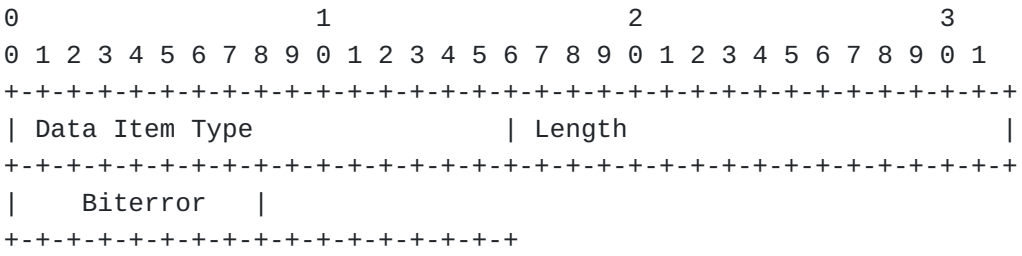

Figure 4

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:

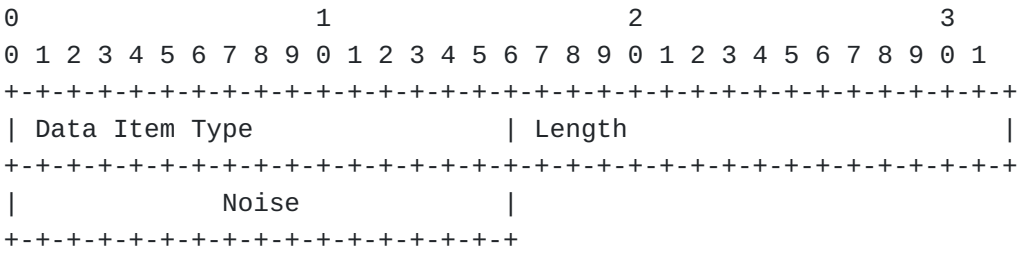

Figure 5

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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