IEEE P802.11
Wireless LANs

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| Suggested resolution for CID1249 |
| Date: 2018-07-12 |
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Abstract

This document provides suggested text to solve a concern raised in REVmd comment collection (CID 1249).

The concern is on use of metric report for mesh STAs.

R0: Initial proposal.

R1: Worked on refinement of the wording (delta are shown with Track Changes); Added pointer information on recent work relating to 802.11s mesh network.

# Comment:

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| **CID** | **PP.LL** | **Comment** | **Proposed Change** | **Suggested Resolution** |
| 1249 | 2557.10 | Sentence reads "Upon reception of a Mesh Link Metric Report frame, the mesh STA may update its local link metric information using the link metric information received. The procedure to update the local link metric information with the link metric information received from a neighbor peer mesh STA is outside the scope of the standard."This sounds like the standard does not specify anything. At least, an example practice of this link metric information should be described in annex. | Add a subclause in annex S (Mesh BSS operation) showing one example of how the link metric report is used. Commenter is willing to provide resolution text. | REVISED: Adopt changes proposed in doc11-18/1254r0. |

# Discussion:

Intended use of the Mesh Link Metric Report frame:

* HWMP path selection relies on link metric (link quality) to establish bi-directional multi-hop L2 End-End path.
* When determining a mesh path, a link metric is determined only at one edge of the link. For example, when determining a quality of the link between STA1 and STA2, only STA1 (or STA2) contributes to determine the link metric.
* Hence, if the link quality is asymmetric on a link, there is a risk that the link quality is not reflected to the mesh path properly.
* Mesh Link Metric Report is a tool to collect link metric value determined by the peer STA of the link. For example, STA1 and STA2 exchange link metric value that each STA determines using Mesh Link Metric Report frame.



However, the standard does not define what should be reported via the Mesh Link Metric Report frame or how the reported value is used.

It should be beneficial if the standard shows an example on:

* What value should be reported to its peer STA via Mesh Link Metric Report
* What STA should do after collecting link metric value from its peer STA

# Proposed changes:

***To REVmd Editor: Insert the following new subclause after S.5 (Airtime link metric usage example):***

**S.6 Link metric reporting example**

When HWMP is activated as the active path selection protocol in a mesh BSS, link metric of a link is determined by a STA that received PREQ frame or RANN frame over the link. To establish reliable mesh path, it is desirable that the link metric value is calculated considering bi-directional link quality, particularly because HWMP generates a single mesh path for bi-directional transmissions. Link metric reporting is used to collect a link metric value calculated by the peer STA of the link, so that STA can determine bi-directional quality of a link at a time.

The following procedure explains one example practice of the link metric calculation using link metric reporting, when HWMP is activated.

1. STA monitors MCS index of Data frames transmitted to a peer STA and calculates averaged metric value *MTX* of the link toward the peer STA. STA updates *MTX* of the link when it transmits Data frame to the peer STA. If the STA has not transmitted Data frames to the peer STA recently, *MTX* might be approximated from strength of the signal (RSSI) received from the peer STA.
2. The STA transmits Mesh Link Metric Report frames containing the metric value *MTX* to the peer STA.
3. When the STA receives a Mesh Link Metric Report frame from the peer STA, it stores the reported metric value as *MRX* of the link. If the STA has not received a Mesh Link Metric Report frame recently, the STA might invalidate *MRX*.
4. When the STA is in need of link metric value of the link, i.e., it received HWMP Mesh Path Selection frame to determine active mesh path, it calculates link metric for the path selection *MPATH* using the following equation.

*MPATH* = *α* × *MTX* + (1 - *α*) × *MRX*

Where *α* is the ratio of the outgoing traffic on the link versus total traffic on the link. If such ratio is unknown, it is set to 0.5. If *MRX* is invalidated, set *α* to 1.0.

# Pointer information to current/recent 802.11 mesh network related efforts:

* Linux-wireless open source community email reflector archive:
<https://marc.info/?l=linux-wireless&w=2&r=1&s=mesh&q=t>
Above link shows recent activity on open source community discussion relating to mesh network, i.e., title containing “mesh”.
Particularly, “hostap” project and “linux-wireless” project are implementing 802.11s mesh network. There are active ongoing efforts to refine or add new features.
* Published technical paper archive (IEEE Xplore):
<https://ieeexplore.ieee.org/search/searchresult.jsp?queryText=802.11s%20mesh%20network&sortType=desc_p_Publication_Year>
Above link shows recent publication containing keyword: 802.11s mesh network.
There are variety of ongoing research work based on 802.11 mesh network. The efforts include (but not limited to): technology assessment, building 802.11s-base test bed, protocol enhancement, applications using the mesh network.

# Reference:

[1] Draft P802.11REVmd\_D1.0.

[2] 11-17/927 “REVmd Working Group Comments for MAC ad-hoc”