**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | Received Signal Weakness (RSW) metric specification for TG10 (L2R) | |
| Date Submitted | [19 November, 2015] | |
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| Re: | [Received Signal Weakness metric] | |
| Abstract | Proposed alternate metric to replace SQS | |
| Purpose | [TG10 (L2R) draft specification improvement.] | |
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* ***Replace 5.2.2.1 with the following text:***

The metric which measures the cost of a path due to reductions in signal strength should have the following properties:

1. As signal strength degrades, the value of the metric should increase.  In other words, the metric measures signal weakness instead of signal strength.
2. The value of the metric should increase rapidly with weakness of the signal, so that links with better signal strength are greatly preferred.  The value field should increase exponentially with loss of signal strength.
3. Links with very strong signals should have very low metric values, close to zero.
4. Signal strength measurements are notoriously unstable and inaccurate, so great precision is not needed.

Make the following definitions:

*Pmax* the maximum feasible value for received signal strength

*Pmin* the maximum feasible value for received signal strength

*Pmeas* the measured value for received signal strength

*P* normalized received power ratio in the range (0,1)

*Max\_RSW* the maximum possible value for the received signal weakness metric

*0*, ** calculated metric values for the received signal weakness

Then *Pmax* / *Pmin* is a positive number greater than 1. Let *P* = (*Pmeas* - *Pmin*) / (*Pmax* - *Pmin*). *P* is a positive number in the range (0,1).  The following formula satisfies properties (1) – (4) above:

* 0* = 2*P* – 1.

* 0* also lies in the range (0,1). In order for the RSW metric ** to be in the range (0, *Max\_RSW*), we multiply * 0* by the scaling factor *Max\_RSW*:

** = *Max\_RSW* \* (2*P* – 1).

In order to use the RSW metric, it is typically sufficient to store only 8 bit values.  For 8 bit values, three bits are used for representing fractional values, leaving five bits for the integer part of the metric.  With this representation, *Max\_RSW* = 317/8 is the maximum possible value of the metric, and is reserved to mean "infinity".  To calculate the metric over a multi-hop route, the link values are summed; anything added to "infinity" results in the same value, "infinity".

Representation in 16 bits can be done in the same way, and allows for a 5 bit fractional value; then *Max\_RSW* = 2047 31/32, and that value is to be reserved as the value for "infinity".

* ***In Table 11, replace SQS with RSW***