**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 | [30 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 the title of 5.2.2.1 with “Received Signal Weakness (RSW)”***
* ***Replace 5.2.2.1 with the following text:***

RSW is a metric which measures the cost of a path due to reductions in signal strength and has the following properties:

1. As signal strength degrades, the value of the metric increases.  In other words, the metric measures signal weakness instead of signal strength.
2. The value of the metric increases rapidly with weakness of the signal, so that links with better signal strength are greatly preferred. The RSW value increases 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, measured in mW

*Pmin* the minimum feasible value for received signal strength, measured in mW

*Pmeas* the measured value for received signal strength, measured in mW

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

*Max\_RSW* the maximum possible value for the RSW LQM

*Min\_RSW* the minimum possible value for the RSW LQM

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

Let *P* = (*Pmax* - *Pmeas*) / (*Pmax* - *Pmin*). *P* is a positive number in the range (0, 1).  The following formula satisfies properties (1) – (3) above:

* 0* (*P*) = *P*8.

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

** (*P*) = ⌊(*Max\_RSW-Min\_RSW*) \* * 0* (*P*) ⌋ + *Min\_RSW*.

For the RSW metric, *Max\_RSW* = 255 and *Min\_RSW* = 1, requiring only 8 bit values for ** (*P*). 256 is the maximum possible value of the LQM metric, and is reserved to mean infinity.  To calculate the RSW metric over a multi-hop route, the link values are summed. In the case where the LQM value of a device is 256, the value stored for the devices PQM should be 65,535.

* ***In Table 11, replace SQS with RSW of type integer and a length of 2 octets***
* ***Insert “Received Signal Weakness RSW” in clause 3.2***
* ***Delete SQS from clause 3.2***
* ***In Table 42, add the following table entries for*** l2rPMax, l2rPMin

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| **Attribute** | **Type** | **Range** | **Description** | **Default** |
| l2rPmax | Integer | milliwatts | Maximum measurable received signal strength in milliwatts | none |
| l2rPmin | Integer | milliwatts | Minimum measurable received signal strength in milliwatts | none |