**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 | [11 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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The metric which measures signal strength should have the following properties:

* As signal strength degrades, the value of the metric should increase.  So, in fact, it would be a metric measuring signal weakness instead of signal strength.
* 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.
* Links with very strong signals should have very low metric values, close to zero.
* Signal strength measurements are notoriously unstable and inaccurate, so great precision is not needed.

Define *p*0 to be the maximum feasible value for received signal strength.  Define *p* to be the measured received signal strength.  Then, *p*0/*p* is a positive number greater than 1.  Let *x* = ((*p*0/*p*) - 1), and *v* be the metric value.  The following basic formula satisfies the above properties:

*v* = *ex* – 1, where *e* (Euler's number) is approximately 2.718.

In practice, it's not necessary to use the number *e*, although *e* does have some nice properties.  It is a lot easier to use 2 as the exponential base, so that the metric value would instead be:

*v* = 2*x* - 1.

In order to use this metric, it may be sufficient to store only 8 bit values.  For 8 bit values, we should allow three bits for representing fractional values, leaving five bits for the integer part of the metric.  With this representation, 31 7/8 would be the maximum possible value of the metric, and would be reserved to mean "infinity".  In order to calculate the metric over a multi-hop route, the link values would be added together, and anything added to "infinity" would result in the same value, "infinity".  
  
Representation in 16 bits could be done in the same way, and then would allow for a 5 bit fractional value and a maximum value of 2047 31/32, which would be reserved to mean "infinity".