Perytons

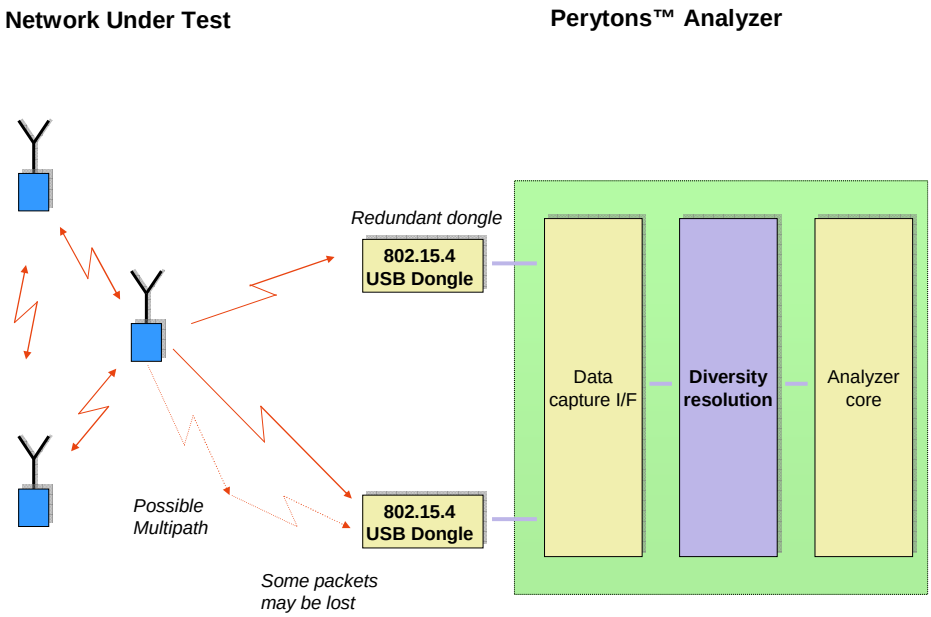
Perytons™ Antenna Diversity

Wireless communications at 2.4 GHz is subject to packet loss due to multi-path interference. This is especially severe in an indoor environment due to reflections from walls and fading due to other objects (e.g. people moving about).

Some 2.4 GHz protocols such as Bluetooth use frequency hopping to combat multi-path, which is frequency selective. They are therefore relatively robust, only suffering from the occasional loss of a single packet. 802.15.4, on the other hand, is more sensitive to multi-path since it uses a fixed channel .

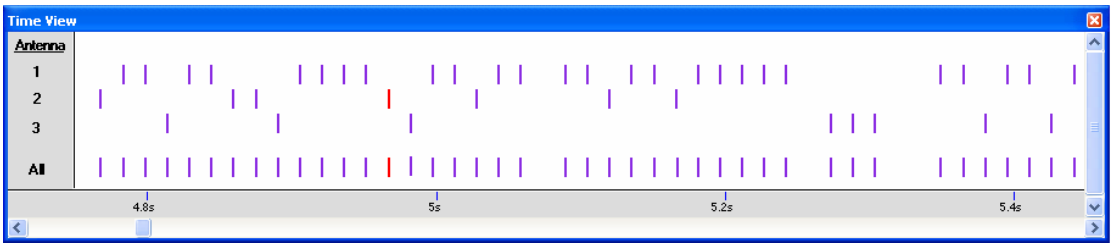
A normal communication link between a pair of network nodes will use acknowledgements and retransmissions to recover lost packets. A receive-only element such as protocol analyzer, on the other hand, has no way of asking for a retransmission.

The Perytons™ analyzer overcomes this problem by using multiple receiver dongles that are tuned to the same channel. The wavelength of the 2.4 GHz signal is 12.5cm, and a distance of 6cm or more between the dongles tuned to the same channel drastically reduces packet loss due to multi-path, dramatically increasing the reliability of data capture and analysis.



Example

The following plot was taken in a harsh indoor environment with multiple concrete walls. A 802.15.4 Beacon transmitter was placed 30 feet away from the analyzer, with no line of sight. 3 antennas were used, placed so the distance between the receiver dongles was sub optimal (3.5cm). Messages in red are messages with a bad FCS (CRC).



The number of messages transmitted during the above time window was 45. Each antenna detected on average 20 good messages. Using 3:1 diversity increased the detection rate from 44% to 89% (40 messages out of 45).

In line-of-sight conditions, the typical packet loss per antenna is 0.5-2%, so a two-antenna diversity scheme (assuming proper antenna separation) results in a 0.05% packet loss rate