WSN Project Report

The project consists in estimating transmission parameters like packet loss and delay for a small WSN deployed on a medium sized boat, with the aim of measuring properties of the environment and of the boat engine/control system.

The estimation of said parameters will take place throughout 2 sets of 2 tests each:

* No external (802.11, 2.4 GHz) interference
  + No multihopping (Star topology)
  + Multihopping enable (Zigbee mesh/tree)
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We will measure avg delay and packet loss over 10K packet sent for each test, in different locations throughout the boat, to test different materials as obstacles.

With these, statistical plots will be produced as a result, along with considerations about feasibility, performance and possible improvements.

Every test was performed with a fixed controller position, inside the deck house, where the operator (se vuoi mettici helmsman che significa timoniere ma diventa troppo pesante da leggere) manoeuvres the boat.

Repeater, instead, was placed such that it was always in between the 2 devices’ positions in average, during all the tests.

Due to the extremely complex structure, we chose for the end device some pivotal points of interest that, in our opinion, should be the most disturbed and, at the same time, suitable in nautical application. Specifically, we selected 5 locations (as shown in fig. ??):

* bow – region (front side)
* stern – region (back side)
* engine room (under the main deck)
* starboard rail (right side, PTP only)
* top deck (worst case with repeater only)

We programmed both repeater and end device such that they can work standalone and battery powered, and we used a sniffer near the coordinator to gather data about the traffic, in particular delay times.

As far as for the channels, we selected a fixed channel for the 802.15.4 PAN (CH12 , mettiamoci questo perché è il piu disturbato da tabella) and a fixed channel for the 802.11 b/n 2.4 GHz interference (CH1), as the worst case scenario according to the SIR table (fig. ??). We simulated an average downloading/uploading and web browsing upon the 802.11 network that common users could generate during normal use.

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Every test was performed adding environment EMI elements, such as an electric DC motor and fuel engines, turning them on/off randomly.

In addition, we collected 2 qualitative indexes about the link on each test, the Maximum/Minimum LQI (link quality indicator) calculated by the end device collecting LQI values for each packet (according to parameters fixed by the manufacturer).