

Generation of Controllable Radio Interference for Protocol Testing in Wireless Sensor Networks

Carlo Alberto Boano and Kay Römer
Institut für Technische Informatik - Universität zu Lübeck (Lübeck, Germany)

Zhitao He and Thiemo Voigt
Networked Embedded System Group - Swedish Institute of Computer Science (Kista, Sweden)

Marco Antonio Zuniga
Digital Enterprise Research Institute (Galway, Ireland)

Andreas Willig
Technische Universität Berlin (Berlin, Germany)

Problem Description:

- Radio Interference affects significantly the performance of MAC and Querying protocols in WSN
- More and more electronic devices sharing the same frequencies will be deployed in the next future
- Testing the impact of interference in WSN has been difficult because of the unavailability of low-cost tools to create reproducible and controlled interference patterns

State of the Art:

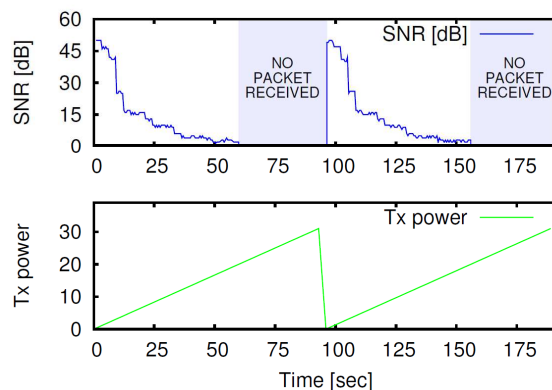
- Most solutions are either expensive or inaccurate
 - ✗ Software Defined Radios are precise but costly
 - ✗ Packet Storms are inaccurate and rigid
 - ✗ External interferers such as Wi-Fi and Bluetooth can not be limited to a particular 802.15.4 channel

Solution:

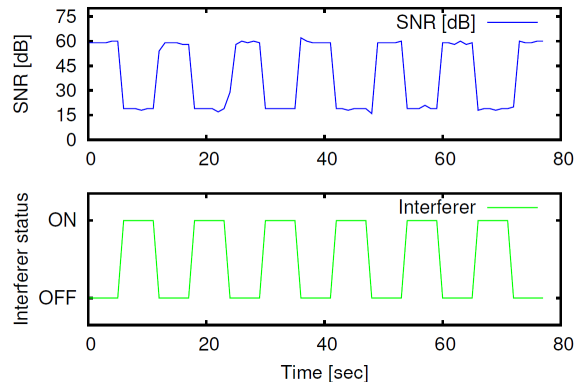
- Leverage the special test modes of the Chipcon radios
- A continuous carrier is sent on a specific channel
- Different types of carriers easy to generate and control

Demo:

- The goal is to control the SNR value of the ongoing communications and create temporary interruptions of connectivity on selected nodes
- A transmitter-receiver pair sends continuous packets
- The output power level of the interferer is increased by clicking on the user button of the Tmote Sky: a single click increases the power level of one unit.
- A Graphical User Interface shows a software-based spectrum analyzer on the 2.4 GHz ISM band. The analyzer is implemented using the CC2420 scanned values and shows the ongoing interference in all 802.15.4 channels



The interference generated through the test modes of the CC2420 radio can be easily tuned by changing the transmission power and the distance from the nodes we want to interfere.



We can also control precisely the instants of time in which the interferer is active, creating different patterns of interference. For example, we may want to generate an intermittent interference.

