

Wireless Sensor Network Laboratory

Nick Zhou, Oguzhan Zengin, Samyuktha Sena Indrasena

December 6, 2022

1 Simple Packet

1.1 Exercise 1: What does the value "6" stand for?

Length of the string sent over the communication channel. Ex: "Hello", 6 – Characters +NULL

1.2 Exercise 1: When is the broadcast recv() function called?

Broadcast receive function is called when the packet is received.

2 MAC Layer

2.1 Exercise 3: How will the following implementations influence the RTT and packet loss rate?

When the inter-packet time is decreased to a certain value, collisions start and round trip time increases considerably. This value of the inter-packet time depends on the packet length. Longer the packet, longer the inter-packet time is needed to avoid collisions.

2.2 nullRDC

NullRDC does not provide any power saving mechanisms, but has largest power consumption. It has the best performance for latency and reliability with a few nodes and causes collisions when there are many nodes.

2.3 contikiMAC

The ContikiMAC driver will turn off the radio between packet intervals for most of the time. ContikiMAC checks the channel for incoming packet, if the channel is clear, the node will shortly return to sleep, and the radio is powered off. Packet loss is considerably low in case of ContikiMAC.

2.4 CSMA

High packet deliver rate and we re-transmit in case of collisions and we sense the channel before sending.

2.5 nullMAC

It is a simple pass-through protocol that simply calls the appropriate RDC functions. Does not allow any re-transmissions. The packet losses are high.

3 Routing

3.1 Exercise 1: How does the mote know where to send a packet? What are the different processes doing?

The mote recognizes the other motes in the network with their nodeID. In the current scenario we have three motes connected to each other. It routes its next hop and the destination mote with the help of the look up table. The different processes are:

- Routing : The packet traverses through the shortest path to reach its destination, with the help of the look up table. The metric used to find the shortest path is hop count.
- Send process : This process checks for two conditions: If there is a new packet in the buffer or if the timer has expired.
- Destination reached process : Once the packet address matches the destination address, the message is received at the destination. To continue to the packet in a forever loop, the destination address is re calculated. On receiving a packet with red color, the direction of rotation is reversed.

4 On-Board Sensors

4.1 Exercise 1: Modify the sensing mote's code to also print the value of the on-board temperature sensor together with the battery voltage. What are the units of the read value?

- Temperature - mC (milli Celcius).
- Battery Voltage - mV (milli volts).

5 Serial Link

5.1 Exercise 1: A communication port (e.g. ttyUSB0) should now be listed in the combo-box. Select it and click open. Add a sensor mote of your choice to the network. What happens?

Displays the serial data on the Qt interface. Qt interface- serial link messages and displays the temperature in the graphical interface.

6 Real-Time Display

6.1 Exercise 1: Add a On-board sensors mote to the network as in the last exercise. What happens?

When the On-board sensor mote is added to the network, the sensor values can be monitored on through the serial connection on the Qt interface.

7 Radio Signal Display

7.1 Exercise 1: Read the software and Qt code. Do you understand it? How does the serial UART communication work?

UART communication: which can be used to interface the sensor data to communicate the values with the development boards. Qt serial port library for communication (QT specific). The data through serial port is displayed through the interface.