

Lab 2

Broadcasting Data with the RFM12B-S2 Radio Module

The aim of this second lab is to become familiar with basic network functionality using the rfm12 wireless transceiver and Il Matto development board. This will build on the first lab (getting two boards to communicate) by implementing a simple MAC algorithm for broadcasting across a shared channel.



Schedule

Preparation time : n/a

Lab time : 3 hours

Items provided

Tools : n/a

Components : RFM12B-S2 Radio Module (1 each)

Equipment : Oscilloscope, Logic Analyser

Software : n/a

Items to bring

Essentials. A full list is available on the Laboratory website at
<https://secure.ecs.soton.ac.uk/notes/ellabs/databook/essentials/>

Revision History

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New lab for 2015/16

1 Aims, Learning Outcomes and Outline

These lab exercises will provide an introduction to computer networks and wireless communication using the Il Matto development board. In particular, in the first lab you learned how to use the RFM12B-S2 wireless transceiver (transceiver = receiver + transmitter) to enable communication between two Il Matto boards, and the basics of how to implement a protocol stack.

In this second lab you should not worry about protocol layering. We will explore this in the third and final lab.

In this lab, you will start to implement basic networking functionality, by exploring some of the features of the RFM12B-S2 module and implementing a basic MAC 0-persistent CSMA algorithm.

2 Preparation

None required.

3 Laboratory work

You should work in pairs for this lab exercise. Each pair should ensure that they have at least one working Il Matto between them, and that at least one person is familiar with the Il Matto and its programming.

Your objective for this lab is experiment with all of the functions provided by the API you experimented with in the last lab, i.e. transmit and receive bits, perform a CCA/ED, change the channel/frequency, etc. If you did not get the API working in Lab 1, a working version is available to download from the ELEC3222 website. You should also extend the API for any hardware features, supported by the RFM12B-S2 that may not currently be implemented in the API (take a look at the datasheet for the module to ascertain these).

Once you have done this, you should use the API to implement a 0-persistent CSMA algorithm, thus allowing all lab pairs to transmit data (an 8-byte ASCII string representing their imaginative lab-pair 'team name') over the same common channel. You should discuss with each other to agree on the frequency/channel you are all going to use.

Whenever your system is not transmitting, it should be listening to the channel and receiving data that anyone else is sending.

At a minimum, you should hard-code your 8-byte ASCII team name into your code, and flash the LED when you receive data from the channel. Alternatively, you could extend this to:

1. Print data to the Il Matto's LCD screen or send it out of the serial port and display it on the PC, and/or
2. Allow you to enter the data to transmit via a terminal prompt on the PC (i.e. via the serial port).

4 Resources

You can find more information about RFM12B-S2 on-line:

- <https://www.sparkfun.com/products/12031>

The following documents are also useful resources:

- RFM12B-S2 Datasheet:
 - <http://cdn.sparkfun.com/datasheets/Wireless/General/RFM12B.pdf>
- Programming guide:
 - https://www.sparkfun.com/datasheets/Wireless/General/RF12B_code.pdf
- RFM12B IC Datasheet:
 - <https://www.sparkfun.com/datasheets/Wireless/General/RF12B-IC.pdf>
- RFM12 Library for Atmel AVR uC's (ATMega8):
 - http://www.das-labor.org/wiki/RFM12_library/en