Description of XBee

The XBee Radio Frequency (RF) module allows wireless communication between devices that have their own XBee module. Figure 1 below shows the module alongside the mbed NXP LPC1768 microcontroller unit that interacts with the XBee.

![Figure 1: An m3pi robot with the XBee unit circled.](image)

All XBee modules must first be configured to communicate with each other before data can be successfully sent back and forth from modules. After configuration, data can programatically be sent through the XBee module of one m3pi robot to one or more of the XBee modules of other m3pi robots with the m3pi robot’s microcontroller unit. Data can also be received in the same way.
Configuration of XBee modules

To be configured, the XBee modules are connected to XBee Explorers, which are pieces of hardware connectable to a computer by usb or usb cables. These allow direct access to the configuration settings of the XBee modules using software called XCTU. The figures below shows an XBee explorer and a screenshot of the XCTU software.

Figure 2: XBee explorer.
On the left of figure 3 is a list of currently recognized and connected XBee units. On the right of figure 3 list all the information and configuring settings of the currently selected XBee module. Here changes can be made to configure how the modules communicate data and which ones can communicate with each other.

To communicate with each other, each module must have the appropriate network settings (all modules that want to communicate with each other must have the same network settings) and each module must have the correct source and destination addresses of the XBee module(s) it wants to send data to/receive data from. For example, network settings like the Channel and PAN ID must be the same for all modules that want to communicate with each other. The destination address of a module determine which modules receive data; any module whose source address is the same as module’s destination address will receive data from that module if it sends data.

Sent and received data can be accessed programmatically by the m3pi’s microcontroller unit.

Programmatically sending/receiving data through XBee modules

The m3pi microcontroller unit can programmatically send and receive data through the XBee modules with serial communication. The raw bytes that make up a message to be sent to other XBee modules can be serially communicated from a user’s source program to the XBee
module. When the raw bytes are received by the XBee module, it will send them to any XBee modules it can inside its network and that have a source address equal to the sender’s destination address (both network settings and address settings come from the each module’s configuration settings).

Likewise, when raw bytes are received by an XBee module, they can be serially communicated to the microcontroller unit and used in a user’s program.