**Experiment No. 7**

**Title:** Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.

**Aim:** To understand the interface between two devices using Zigbee. Transmission of data is demonstrated serially using zigbee and Raspberry Pi.

**Hardware Requirement**:

Raspberry Pi board with an SD card, zigbee.

**Software Requirement:** Raspbian O.S, Python.

**Theory:**

ZigBee is a low-power wireless mesh network standard operating in the 2.4 GHz range.

Zigbee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection.

The technology defined by the Zigbee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or more general wireless networking such as Wi-Fi. Applications include wireless light switches, home energy monitors, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer.

Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. Zigbee is typically used in low data rate applications that require long battery life and secure networking (Zigbee networks are secured by 128 bit symmetric encryption keys.) Zigbee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device.

**XBee** is a brand of radio communication modules that can support a number of protocols, including ZigBee, 802.15.4, WiFi, etc. Its range is 10 to 30 meters. ZigBee is often used in home automation products, though

it is not the only option.

**XBEE-S2C Specifications:**

* Data Rate RF: 250Kbps, serial up to 1Mbps
* Indoor/urban range: 200-ft. (60m) 300-ft. (90m)
* Outdoor/RF line-of-sight range: 4000-ft. (1200m) 2 miles (3200m)
* Transmit power: 3.1mW (+5dBm)/6.3mW (+8dBm) boost mode 63mW (+18dBm)
* Receiver sensitivity: (1% PER) -100dBm/-102dBm boost mode -101dBm
* Serial Data Interface: UART, SPI

Configuration Method: API or AT commands, local or over-the-air (OTA)

Frequency Band: ISM 2.4GHz Receiver Sensitivity: -96 dBm

ADC inputs: (4) 10-bit ADC inputs

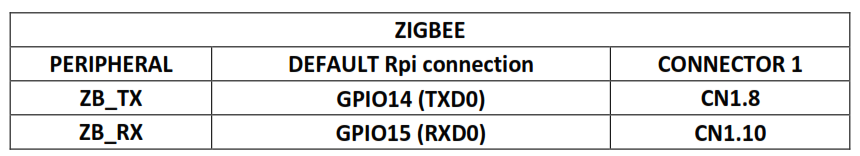
**Method**

we need to enable the serial interface to start transmission of data serial on Raspberry Pi kit board.

Once we enable the port, submit the program to transfer the data from one system.

Then submit the program on other device.

**Digital I/O: 15**

****

**Conclusion:** We have successfully executed the program of serial transmission of file from one device to another.

**Code :(xbee-tx.py - to send the data serially)**

import time

import serial

TRUE = 1

print "Starting program"

ser = serial.Serial('/dev/serial0', baudrate=9600,

parity=serial.PARITY\_NONE,

stopbits=serial.STOPBITS\_ONE,

bytesize=serial.EIGHTBITS

)

time.sleep(1)

def xbeestring(str,cnt):

ser.write(str)

return ser.read(cnt)

try:

print 'MicroEmbedded Zigbee Program'

data = xbeestring('+++',0)

print data

time.sleep(3)

data = xbeestring('AT\r\,n',2)

print data

time.sleep(3)

data = xbeestring('ATID 10\r\n',2)

print data

time.sleep(3)

data = xbeestring('ATCN\r\n',2)

print data

time.sleep(1)

print 'sending data'

while TRUE:

data = xbeestring('\r\n',0)

time.sleep(1)

data = xbeestring(' 0',0)

time.sleep(1)

data = xbeestring(' 1',0)

time.sleep(1)

data = xbeestring(' 2',0)

time.sleep(1)

data = xbeestring(' 3',0)

time.sleep(1)

data = xbeestring(' 4',0)

time.sleep(1)

except KeyboardInterrupt:

print "Exiting Program"

except:

print "Error Occurs, Exiting Program"

finally:

ser.close()

pass

**Code :(xbee-rx.py - To receive the data serially)**

import time

import serial

TRUE = 1

print "Starting program"

ser = serial.Serial('/dev/serial0', baudrate=9600,

parity=serial.PARITY\_NONE,

stopbits=serial.STOPBITS\_ONE,

bytesize=serial.EIGHTBITS

)

time.sleep(1)

def xbeestring(str,cnt):

ser.write(str)

time.sleep(1)

return ser.read(cnt)

try:

print 'MicroEmbedded Zigbee Program'

print '\nenter command mode'

data = xbeestring('+++',0)

print data

time.sleep(3)

print '\nAttention:'

data = xbeestring('AT\r\n',2)

print data

time.sleep(3)

print '\nset PAN ID to 10'

data = xbeestring('ATID 10\r\n',2)

# print data

time.sleep(3)

print '\nexit command mode'

data = xbeestring('ATCN\r\n',2)

# print data

time.sleep(1)

print '\nreceiving data over zigbee'

while TRUE:

data = ser.read()

print data

time.sleep(0.1)

except KeyboardInterrupt:

print "Exiting Program"

except:

print "Error Occurs, Exiting Program"

finally:

ser.close()

pass