

Lab 2 – Temperature sensing using Arduino Uno and Xbee modules for remote monitoring

18644 – Mobile hardware for software engineers

Team 18 (Po-Lin Yeh, Vijith Venkatesh, Vishal Shahane and Yu-chi-Chen)

INTRODUCTION

Temperature is one of the most important factors that have to be monitored in a datacenter in order to maintain a favorable temperature for the data center devices to work without any anomalies. Increasing processor speeds, smaller server form factors and higher server rack densities have all added to the complexity of the temperature management in the modern data center. Not only the temperature management but also the energy consumed by datacenters worldwide has been increasing every year. With this problem in mind we decided to develop a system of sensors, which could be installed in large datacenters and to monitor the datacenter temperature in different regions. In this system, temperature in different regions will be transmitted through the local transmitter after sensing the current temperature and received centrally at receiver node. With this system in place, we aim to address both the temperature monitoring as well as efficient energy utilization. In this exercise we show the working model with single transmitter and single receiver.

We have used Arduino Uno, Xbee 802.15.4 modules, DHT 22 Temperature sensors and a buzzer to implement the alarm system.

CONNECTION & IMPLEMENTATION

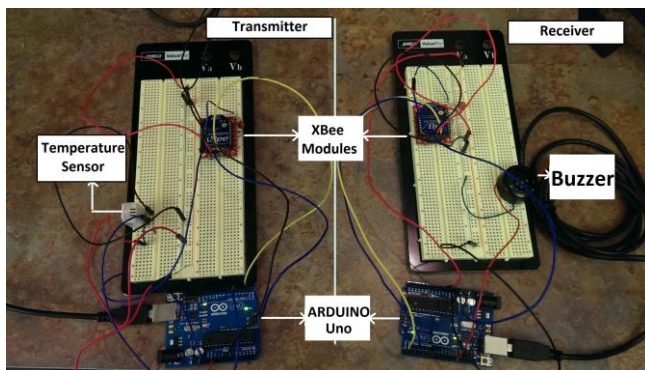


Figure 1 Connection Diagram

Figure 1 shows both the transmitter and receiver connection diagrams. Details of the connections are summarized below:

- In the transmitter board (left side) the XBEE module is connected with the Arduino Uno and the DHT 22 temperature sensor.

- In the receiver board (right side) the XBEE module is connected with the Arduino Uno and the buzzer.

TEMPERATURE SENSOR FUNCTIONALITY

We have used DHT 22 temperature sensor, which is a basic temperature, and humidity sensor. It uses a thermistor to measure the surrounding air and sends out the data. First pin of the sensor is connected to 3-5V power, second pin to the data input and the final pin to the ground. The buzzer we have used has two pins, one of which is for the power and the other is for the ground.

The XBee 802.15.4 module uses Zigbee protocol to communicate wirelessly with another XBee module. These modules are powered and programmed using Arduino Uno microcontroller board. Thus when the system is connected it works seamlessly sensing the temperature and sending out an alarming signal to the receiver.

The transmitter after reading the data from the DHT sensor sends out the data to the receiver one byte at a time. At the receiver end, we construct a string with this single byte by considering a blank space as separator between two strings. Once the complete data is received, we compare the data received with a predefined threshold temperature, if the received temperature is beyond the threshold, an alarm signal is sent to the buzzer.

CONCLUSION & FUTURE PLANS

This project was an attempt to replicate a temperature monitoring system, which is typically deployed in data centers. Although the temperature sensor sends the data for every two seconds, this delay in receiving the data will not have a huge impact on the monitoring system.

As an enhancement to this system we plan to supplement the temperature sensor with the humidity sensor as well as the wind sensor, collecting all the data and displaying on a centralized dashboard. This enhanced system will act as a double validation system and will augment the understanding of the datacenter administrators.

REFERENCES

- [1] <http://arduino.cc/en/Guide/ArduinoWirelessShield> Arduino Time Library, online, <http://playground.arduino.cc/Code/Time> and http://www.pjrc.com/teensy/td_libs_Time.html
- [2] LCD 10862 datasheet, online, <https://www.sparkfun.com/products/10862>