I649E Wireless Sensor Networks

Getting Started Guide

Raspberry Pi 3 Model B

1. Installation

Method 1: NOOBS Installation

i. Download NOOB's Raspberry Pi OS from
https://www.raspberrypi.org/downloads/noobs/
or from mirror at JAIST
http://ftp.jaist.ac.jp/pub/raspberrypi/NOOBS/images/
ii. Extract files into your SD card
iii. Put the SD card back to Raspberry Pi
iv. Boot and install (first item). It takes around 30 minutes to complete.

Note: If you want to connect Raspberry Pi to JAIST wireless network, please do not forget to add MAC address of wlan0 interface (using command `ifconfig` in terminal to see Raspberry Pi network information) in https://rcaci.jaist.ac.jp/apply_wifi_macauth.

Method 2: Raspbian Desktop Image Installation

1. Download Raspbian Desktop at:
http://ftp.jaist.ac.jp/pub/raspberrypi/raspbian/images/raspbian-2018-04-19/2018-04-18-raspbian-stretch.zip
2. Extract file into your computer.
3. Download Etcher at:
https://etcher.io
4. Insert SD card and run Etcher
5. Select Raspbian image file and SD card's drive then click Flash!
6. After finish, unplug the SD card, wait for a while and put it back.
7. Create file name **ssh** in the root folder (without extension)
8. Create file name **wpa_supplicant.conf** in the root folder and edit this file as:

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
network={
        ssid="wlan SSID"
        psk="wlan password"
        key_mgmt=WPA-PSK
    }
```

2. Connect Raspberry Pi through SSH

2.1 Raspberry Pi Configuration

i. Start > Preferences > Raspberry Pi Configuration
ii. Set Hostname e.g. node3
iii. Interface tab > Enable SSH
iv. You can enable VNC for remote desktop capability though VNC Viewer

v. Use this for login as
User: pi
Password: raspberry

2.1.1 Windows

i. Download PuTTY and install from https://putty.org
ii. Enter Hostname.local or IP address

```
node5.local
10.10.0.5
```

2.1.2 Mac and Linux

i. Open terminal
ii. Type

```
ssh pi@<IP address>
ssh pi@<Hostname>
ssh pi@10.10.0.4
ssh pi@node4.local
```

3. Update and Install Essential Software

i. Type

```
sudo apt-get update -y
sudo apt-get upgrade -y
sudo apt-get dist-upgrade -y
sudo pip install --upgrade pip
sudo apt-get install olsrd iperf wavemon python-numpy python-scipy
python-matplotlib -y
```

4. Raspberry Pi wlan0 Ad-Hoc Setup

i. Edit the interfaces file in /etc/network/

```
sudo nano /etc/network/interfaces
```

ii. Add the following

```
auto wlan0
iface wlan0 inet static
    address <IP address>
    netmask 255.255.255.0
    mtu 1500
    wireless-channel <channel>
    wireless-essid <network name>
    wireless-mode ad-hoc
    wireless-ap any
```

iii. Reboot Raspberry Pi to take effect.

5. Optimized Link State Routing Protocol Daemon (OLSRD)

i. Start OLSRD using wlan0 interface on Raspberry Pi with debug level 1

```
sudo olsrd -i wlan0 -d 1
```

ii. Check the communication by using ping command

```
ping <IP address>
ping 10.10.0.5
```

iii. For multi-hop capability. You need to force two nodes to use a gateway by using firewall to block each other. There is no direct implementation on OLSRD.

```
sudo iptables -A INPUT -m mac --mac-source XX:XX:XX:XX:XX:XX -j DROP
```

iv. Use the command `route or traceroute` to see if they use a gateway

```
route
traceroute <IP address>
```

6. Throughput Measurement

The command is `iperf`. `iperf` is a tool for active measurements of the maximum achievable bandwidth on IP networks.

- Server side

  ```
  sudo iperf -s
  ```

- Client side

  ```
  sudo iperf -c <IP address> -t <time in second>
  ```

Revised on 27 June 2018