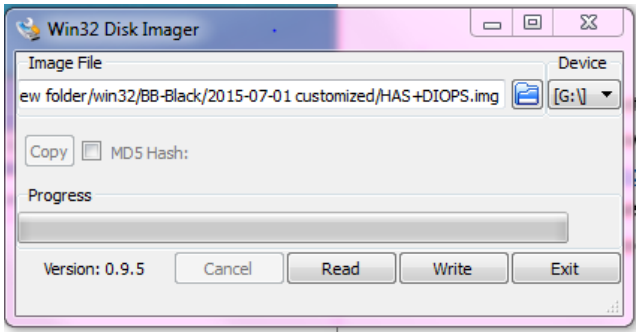
BeagleBone Setup Operation:

- Download *Win32DiskImager* : http://sourceforge.net/projects/win32diskimager/?source=typ_redirect
- Get the Image File (Ubuntu)
  - Insert SD card (old one with image file) into PC.
  - Open 'Win32Disk Imager'
  - Select 'J: Boot' to 'Device'
  - Select 'Img' File (download from internet) to 'Image File'
  - 'Read' to read data from Device to Image File
- Write Ubuntu to SD Card
  - Insert the SD card to PC
  - Choose the disk in Win32DiskImager
  - Choose the file *HAS+DIOPS*
  - Choose "Write" to write the Ubuntu to SD card



- Clear the Wifi Information in ImgFile
  - Insert SD card with ImgFile into BeagleBone
  - Connect BeagleBone with PC monitor, power bank and turn on
  - Input 'sudo nano /etc/udeo/rules.d/70-persistent-net.rules'
  - Delete two lines wifi information
  - Input 'poweroff'
- Get the IP Address of Board
  - Insert the SD Card to BeagleBone, then connect monitor and keyboard to the BeagleBone.
  - Insert the TP-link to the BeagleBone first. Then start the BeagleBoard. Before input username and password, insert the Wireless finally.
  - Input "iwconfig" to check the network setting.
    . If TP-link is wlan0 and Wireless is wlan1, it's ok.
    . If not, input "nano /etc/udev/rules.d/70-persistent-net.rules" to revise the wlan number. Then, "**reboot**" is necessary.

```
root@board1:~# iwconfig
wlan0     IEEE 802.11bgn  ESSID:off/any
          Mode:Managed  Access Point: Not-Associated   Tx-Power=0 dBm
          Retry  long limit:7   RTS thr:off   Fragment thr:off
          Encryption key:off
          Power Management:off

lo        no wireless extensions.

eth0      no wireless extensions.

wlan1     IEEE 802.11bgn  ESSID:"OpenWrt"
          Mode:Managed  Frequency:2.462 GHz  Access Point: 10:FE:ED:A9:F4:A0
          Bit Rate=54 Mb/s   Tx-Power=20 dBm
          Retry  long limit:7   RTS thr:off   Fragment thr:off
          Encryption key:off
          Power Management:off
          Link Quality=37/70  Signal level=-73 dBm
          Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
          Tx excessive retries:3  Invalid misc:5   Missed beacon:0
```

```
, KERNEL=="wlan*", NAME="wlan1"


, KERNEL=="wlan*", NAME="wlan0"
```

- Input “ifconfig” to check Gateway IP Address: Wlan1 (=Wireless), it is “wlan1: inet addr: 192.168.1.240” Write down this IP Address as each gateway IP.

```
root@board1:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 6c:ec:eb:b0:04:b3
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Interrupt:56

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

wlan1     Link encap:Ethernet  HWaddr 00:c1:41:28:0a:54
          inet addr:192.168.1.240  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fd24:6a24:110c:0:5571:3b44:4f2d:da32/64 Scope:Global
          inet6 addr: fe80::2c1:41ff:fe28:a54/64 Scope:Link
          inet6 addr: fd24:6a24:110c:0:2c1:41ff:fe28:a54/64 Scope:Global
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1111 errors:0 dropped:0 overruns:0 frame:0
          TX packets:164 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:117985 (117.9 KB)  TX bytes:25372 (25.3 KB)
```

- Input “nano /etc/hostname” to check/revise the Board Name

```
board1
```

- After finishing setup 5 beaglebone, input “nano /etc/hosts” to revise the Board Names and IP addresses.

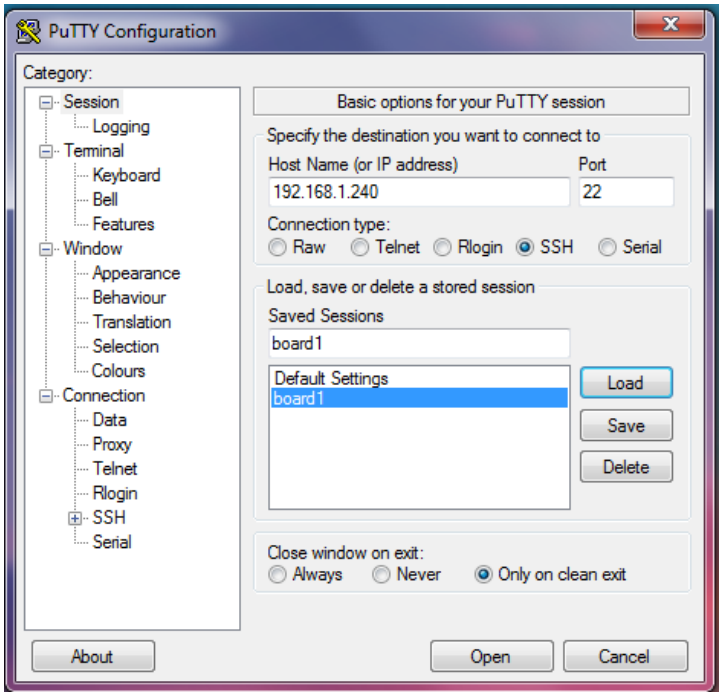
```
127.0.0.1 localhost
127.0.1.1 ubuntu-armhf

192.168.1.117   board1
192.168.1.160   board2
192.168.1.116   board3
192.168.1.248   board4
192.168.1.115   board5
```

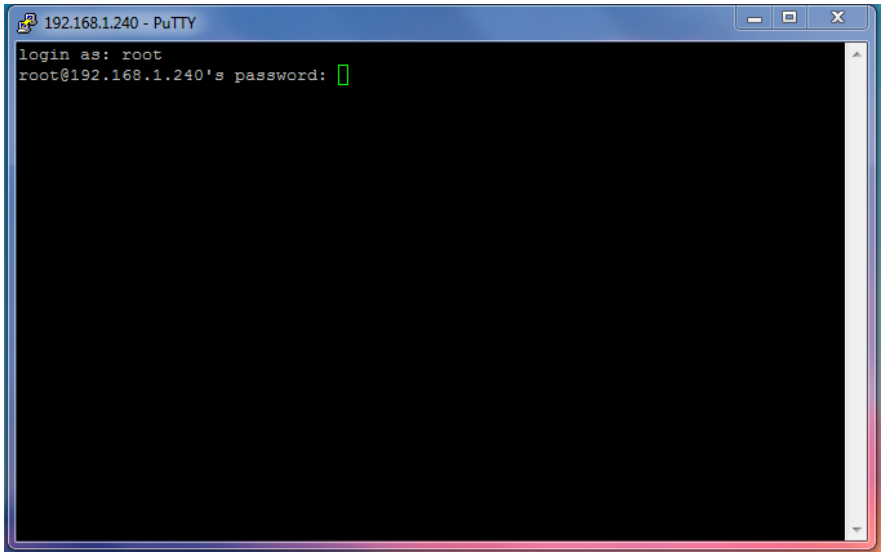
Note: Everytime when network environment changes or the Gateway IP changes, above two operation is necessary.
Note: When set and check one Beaglebone IP, it is necessary to turn on other Beaglebones in order to avoid IP address conflict.

- Control BeagleBone in Windows system
- Insert TP-Link to PC and connect “Openwrt” (password: roottoor)
- Download *Putty*, http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
- Run Putty, input the IP Address and save the board name.

Note: PC and Gateways must be in the same network ‘OpenWrt’(password: roottoor)

- Finally, click “open” to start the Board. The shown means successful.





Ubuntu Setup Operation:

- Install Ubuntu 12.04 on computer. (wubi file: https://www.dropbox.com/s/900kckx076qalxa/wubi.exe?dl=0)
- Equip Ubuntu with applications and library, such as Mysql, PHP and so on, according to Handbook 'Ubuntu' (https://www.dropbox.com/s/gi1672i7phwey4w/Ubuntu.pdf?dl=0)
- Build Mysql

- Save a 'DIOPS_DVSM' file in Documents
- -- mysql –u root –p
- -> create database HAS;
- For Training:
    - Open another terminal:
    - -- cd /home/Documents/DIOPS_DSVM/…/ …/ [TrainingDataFileName]
    - – chmod +x *.perl

    - -- ./uploadTrain.perl [Explain: this perl file can write data file into mysql]
- For real-time positioning:
    - -- Documents/DIOPS_DSVM/… …/ … …/ DIOPS or HAS [Note: both is necessary, run separately]
    - -- ./dumpRecord.perl
- Set PHP:
- -- Document/DIOPS_DSVM/PHP
- – chmod +x *.perl
- -- ./php.perl
- Open chrome, input the server IP (PC IP, 'ifconfig') and search. If the file can be seen, it means operation is ok.

Training Setup Operation:

- IP Address Revise
- Open chrome – input '192.168.1.1'(the website of TPLINK) – input admin and password – check the IP address and its name– add fixed IP address and its name to the list
- -- sudo nano /etc/hosts to revise the gateway IP and its name on the server
- Log in gateways using board'n'
- -- nano /etc/hosts to revise the gateway1 IP and its name on the board, then run the 'cp_etc_hosts.perl' to copy the hosts file to every board
-
- In new terminal, -- ifconfig to check the Mysql IP (server IP)
- Check PAD IP in PAD Setting.
- In each gateway terminal, -- cd /home/Ubuntu/DIOPS/
- Revise 'sniffer_predict.perl' and 'main.perl' using PAD IP and server IP, then run the 'cp_main_sniffer.perl' to copy the hosts file to every board.
- Training
- -- ./main.perl to collect training data. Collect 400 datas in every block.
- For the pad, click 'Generate SVM Model' – 'Generate Class Label' – 'Predict Accuracy', to generate the model file.

Note: if the home/Ubuntu/DIOPS/src files are changed, it is necessary to run 'compile' firstly.

Testing Setup Operation:

- Download Map and Model to Ipad
- Guarantee the PHP working well
- Put the model and map into Map and Model File.
- APP - Setting - revise the MYSQL IP (server IP) - revise the path of Map and Model separately – Download
- Testing
- -- ./sniffer_predict.perl