

# Introduction to Engineering Using Robotics Experiments

## Lecture 11

### Connecting and Using Unix / Linux on Edison Board

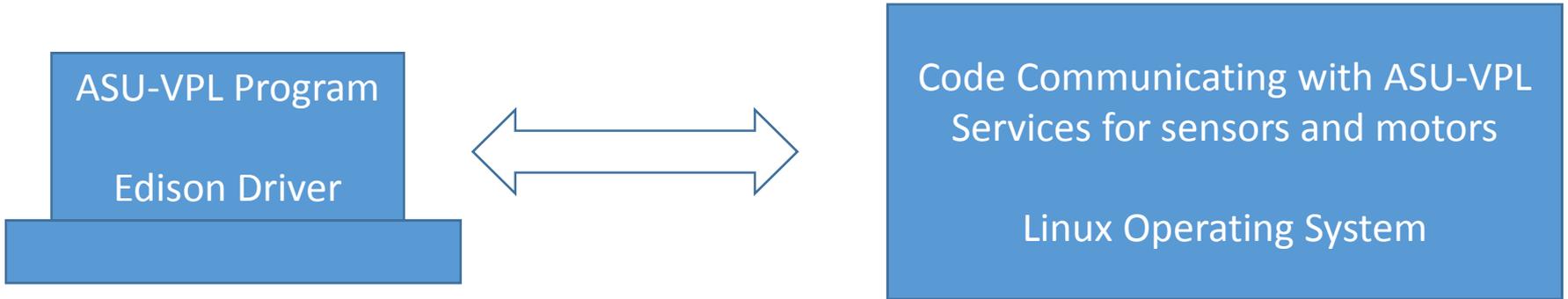
Yinong Chen



# Unix versus Linux

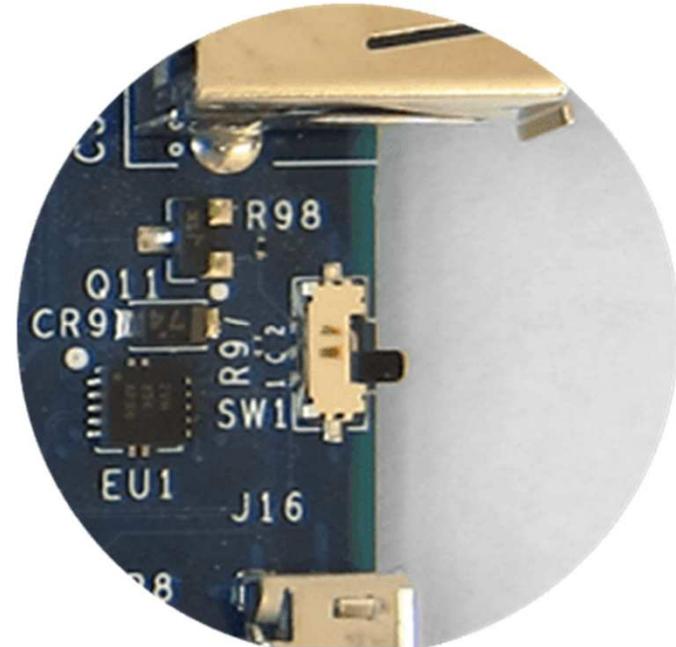
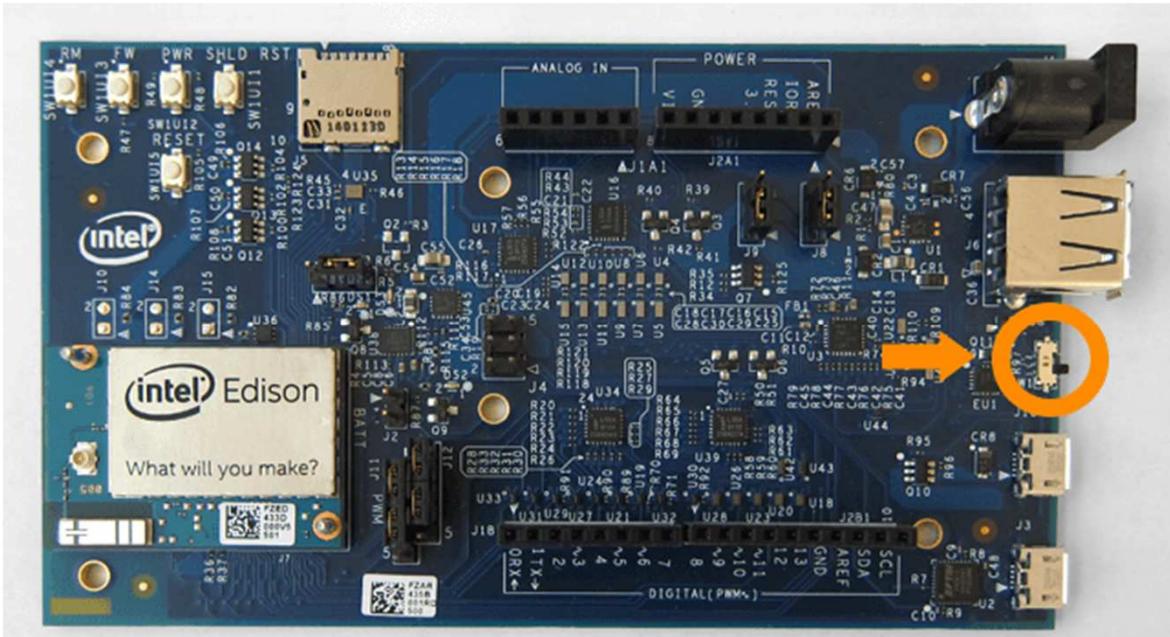
- MacOS, and Windows are owned by a single company.
- Unix is an operating system standard used by multiple vendors, including Solaris, Intel, HP etc. as workstation and server operating system. These are bigger systems.
- Linux is a free and open source version of Unix. It is typically used in smaller systems, such as PC and embedded systems.
- Commercial products can be developed on Linux
  - Android (Google)
  - Redhat (Red Hat, U.S.)
  - Ubuntu (Canonical Ltd, U.K.)

# Connecting ASU-VPL to Edison



Computer Running Windows

Edison Board



# Accessing Linux (Ubuntu) on Edison

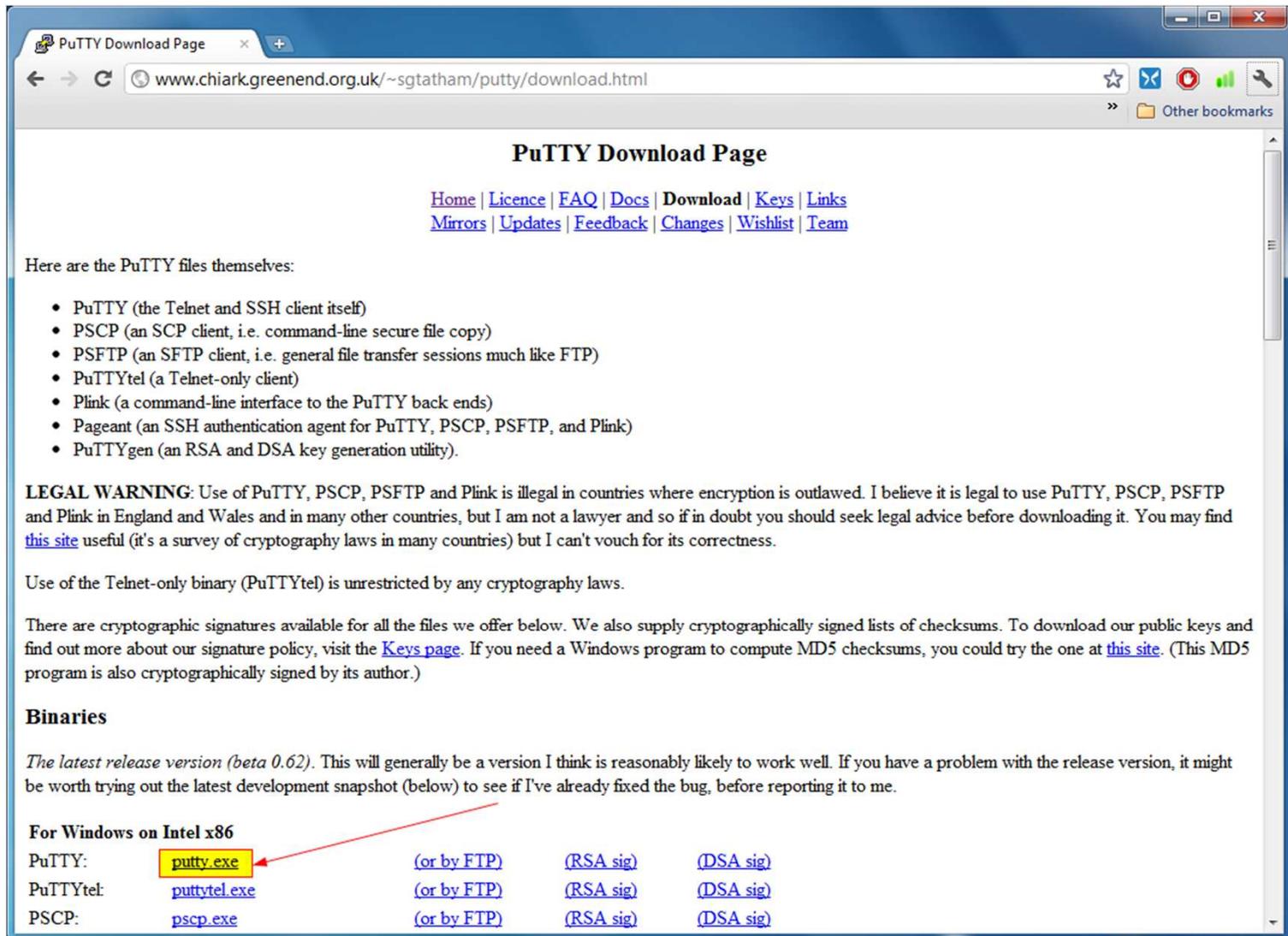
- Install Intel Edison Driver

- Intel Edison Board Installer: The driver is required on your computer in order for ASU-VPL to communicate with the Edison Board.
- <https://software.intel.com/en-us/iot/downloads>

- Connecting to Edison Board Using PuTTY

- Download at <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>
  - For Windows, select the first option, “putty.exe”.
  - PuTTY includes multiple connection methods, including USB and SSH

# Download PuTTY



The screenshot shows a web browser window with the address bar displaying `www.chiark.greenend.org.uk/~sgtatham/putty/download.html`. The page title is "PuTTY Download Page". Below the title is a navigation menu with links: [Home](#), [Licence](#), [FAQ](#), [Docs](#), [Download](#), [Keys](#), [Links](#), [Mirrors](#), [Updates](#), [Feedback](#), [Changes](#), [Wishlist](#), and [Team](#). The main content area starts with the text "Here are the PuTTY files themselves:" followed by a bulleted list of software components. Below the list is a "LEGAL WARNING" section, followed by a paragraph about Telnet-only binaries, a paragraph about cryptographic signatures, and a "Binaries" section. The "Binaries" section includes a sub-section "For Windows on Intel x86" with a table of download links. A red arrow points to the `putty.exe` link in the table.

**PuTTY Download Page**

[Home](#) | [Licence](#) | [FAQ](#) | [Docs](#) | [Download](#) | [Keys](#) | [Links](#)  
[Mirrors](#) | [Updates](#) | [Feedback](#) | [Changes](#) | [Wishlist](#) | [Team](#)

Here are the PuTTY files themselves:

- PuTTY (the Telnet and SSH client itself)
- PSCP (an SCP client, i.e. command-line secure file copy)
- PSFTP (an SFTP client, i.e. general file transfer sessions much like FTP)
- PuTTYtel (a Telnet-only client)
- Plink (a command-line interface to the PuTTY back ends)
- Pageant (an SSH authentication agent for PuTTY, PSCP, PSFTP, and Plink)
- PuTTYgen (an RSA and DSA key generation utility).

**LEGAL WARNING:** Use of PuTTY, PSCP, PSFTP and Plink is illegal in countries where encryption is outlawed. I believe it is legal to use PuTTY, PSCP, PSFTP and Plink in England and Wales and in many other countries, but I am not a lawyer and so if in doubt you should seek legal advice before downloading it. You may find [this site](#) useful (it's a survey of cryptography laws in many countries) but I can't vouch for its correctness.

Use of the Telnet-only binary (PuTTYtel) is unrestricted by any cryptography laws.

There are cryptographic signatures available for all the files we offer below. We also supply cryptographically signed lists of checksums. To download our public keys and find out more about our signature policy, visit the [Keys page](#). If you need a Windows program to compute MD5 checksums, you could try the one at [this site](#). (This MD5 program is also cryptographically signed by its author.)

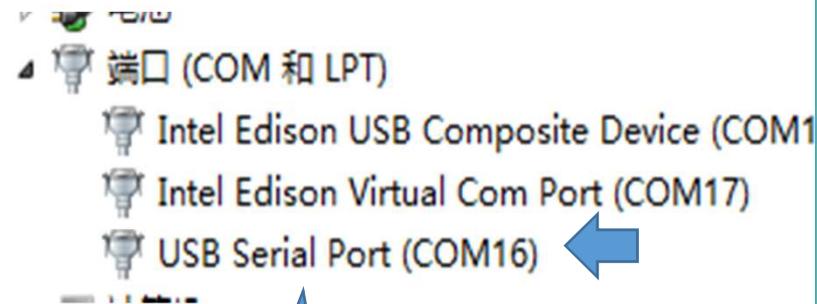
**Binaries**

*The latest release version (beta 0.62).* This will generally be a version I think is reasonably likely to work well. If you have a problem with the release version, it might be worth trying out the latest development snapshot (below) to see if I've already fixed the bug, before reporting it to me.

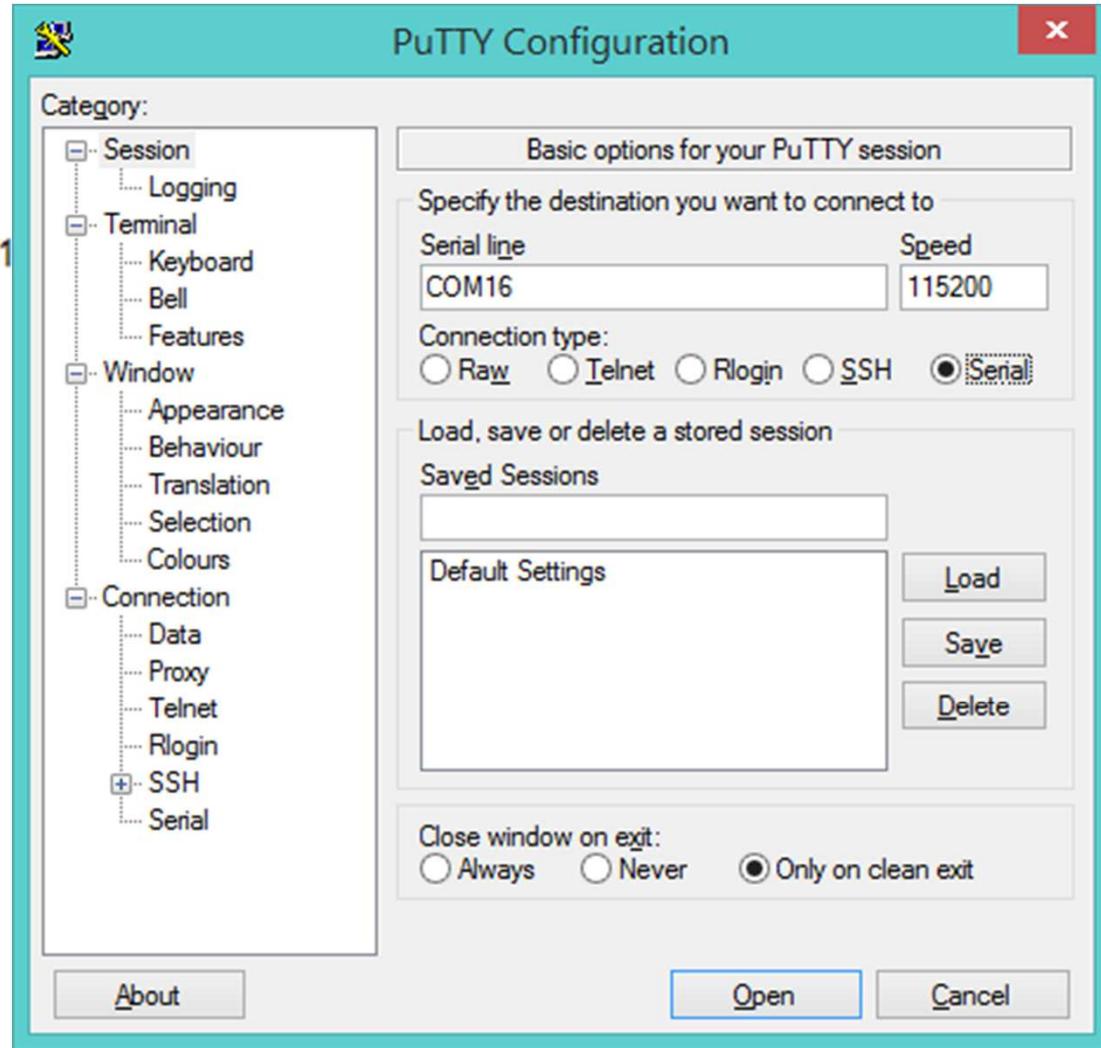
**For Windows on Intel x86**

PuTTY:	<a href="#">putty.exe</a>	<a href="#">(or by FTP)</a>	<a href="#">(RSA sig)</a>	<a href="#">(DSA sig)</a>
PuTTYtel:	<a href="#">puttytel.exe</a>	<a href="#">(or by FTP)</a>	<a href="#">(RSA sig)</a>	<a href="#">(DSA sig)</a>
PSCP:	<a href="#">pscp.exe</a>	<a href="#">(or by FTP)</a>	<a href="#">(RSA sig)</a>	<a href="#">(DSA sig)</a>

# Connect to Edison Using PuTTY



After successfully installed Edison Driver, you will see this USB Serial Port



# Useful Linux Commands

<http://www.math.utah.edu/lab/unix/unix-commands.html>

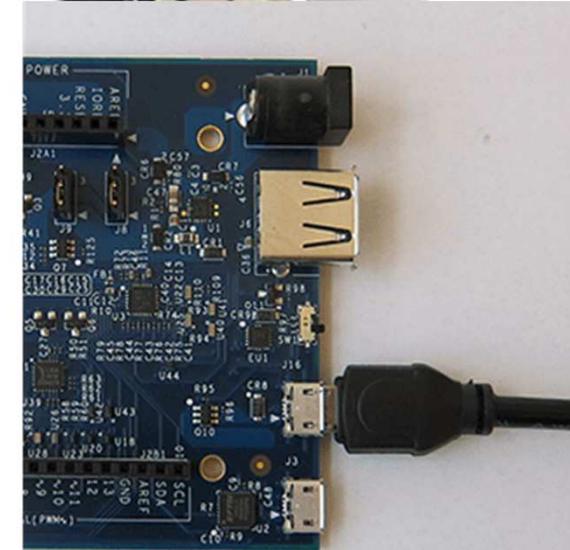
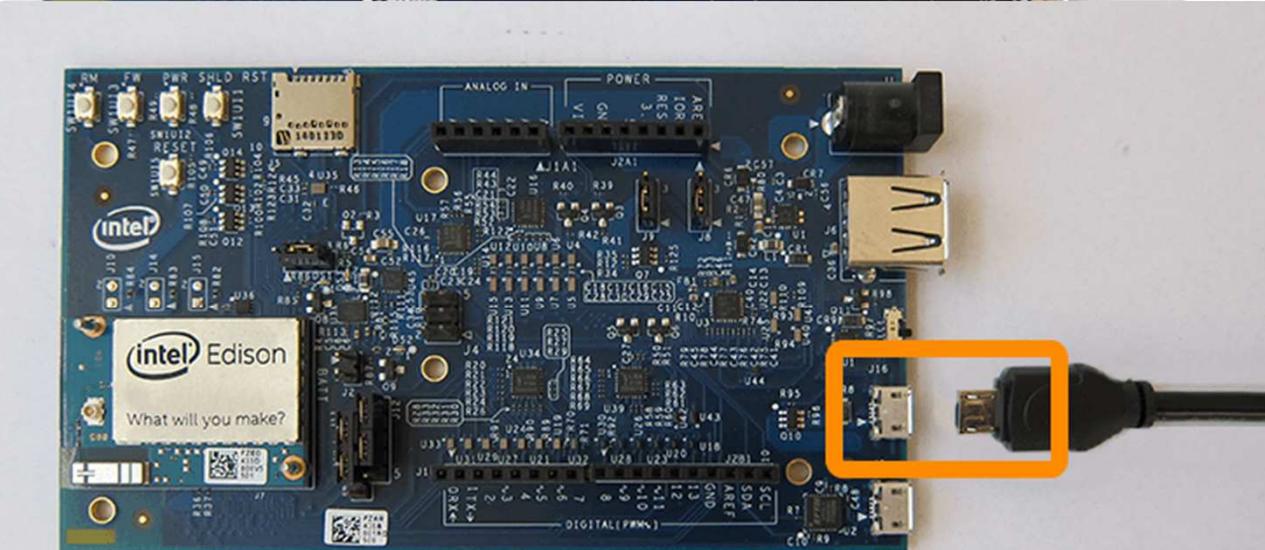
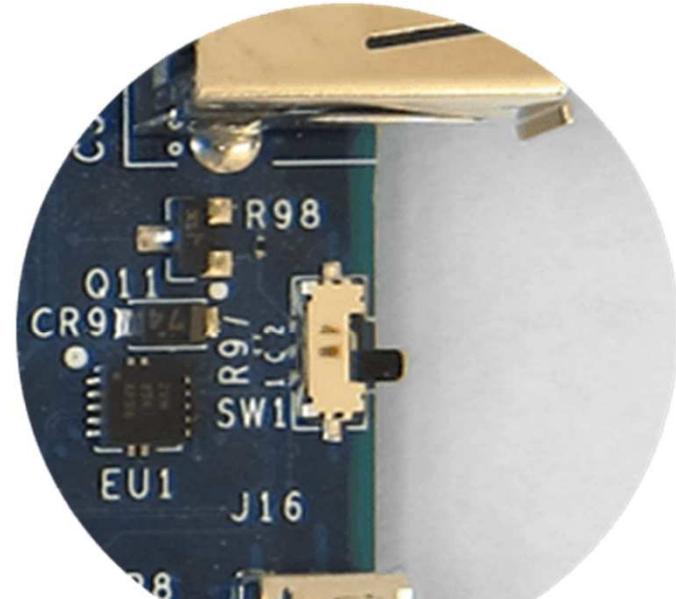
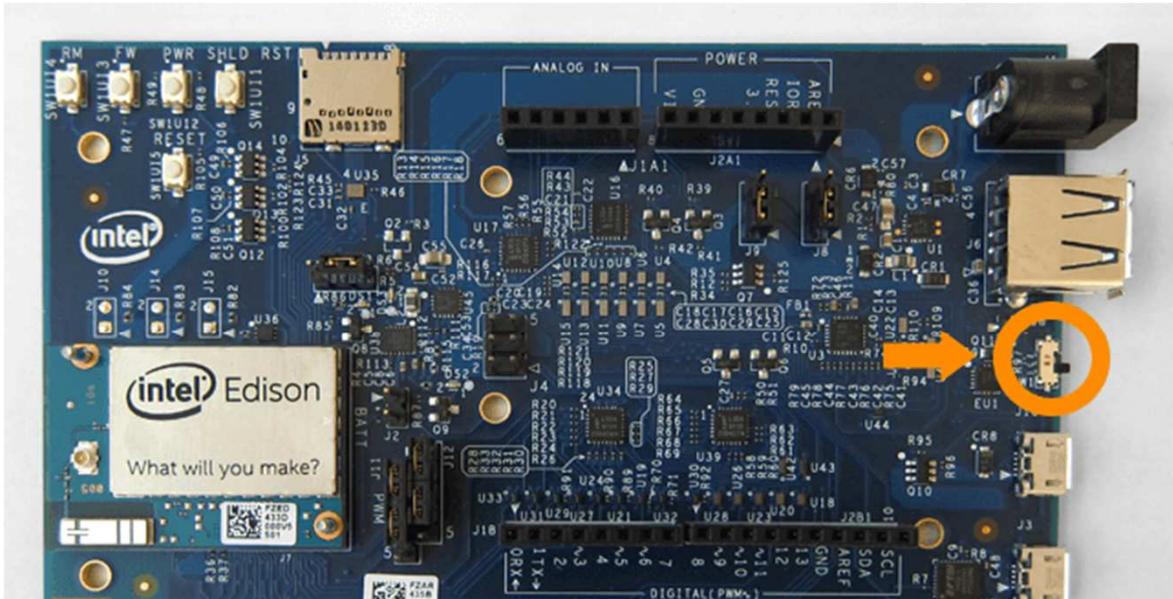
- `ls` List directory contents
- `cd ..` Move up one directory
- `cd <foldername>`
  - Enter into a folder/directory.
- `pwd`
  - Print working directory (currently entered directory)
- `mkdir <newdirectoryname>`
  - To create a new directory within the current directory
- `rmdir <directoryname>`
  - To delete a non-empty directory in the current directory
- `mv <directory1/file1> <directory2/file2>`
  - Move file1 from directory1 to directory2 and change name to file2
- `./<binname>`
  - Run the executable called <binname>.
  - Example: `./run.sh`

# The JavaScript Code in main.js

```
var ROBOT_NAME = 'EdisonRobot';           // Robot name.
var LEFT_WHEEL_PORT = 3;                  // Wheel ports
var RIGHT_WHEEL_PORT = 5;
// The time in ms between checking sensor data.
var SENSOR_POLLING_TIME = 100;
var TRIGGER_PIN = 1;                      // Ultrasonic sensor variables.
var ECHO_PIN = 2;
var distance = -1;
// Distance sensor will be initialized when successfully connects to the board.
// We will do this to make sure we have access to the robot first.
var mySonar;    var touchValue;  var LIGHT_PORT = 0;  var lightValue;
// Port to setup TCP Server on.
var PORT = 8124;
```

# WiFi Connecting Edison Board, if USB Connection Not Working

<https://software.intel.com/en-us/connecting-to-intel-edison-board-using-ethernet-over-usb>



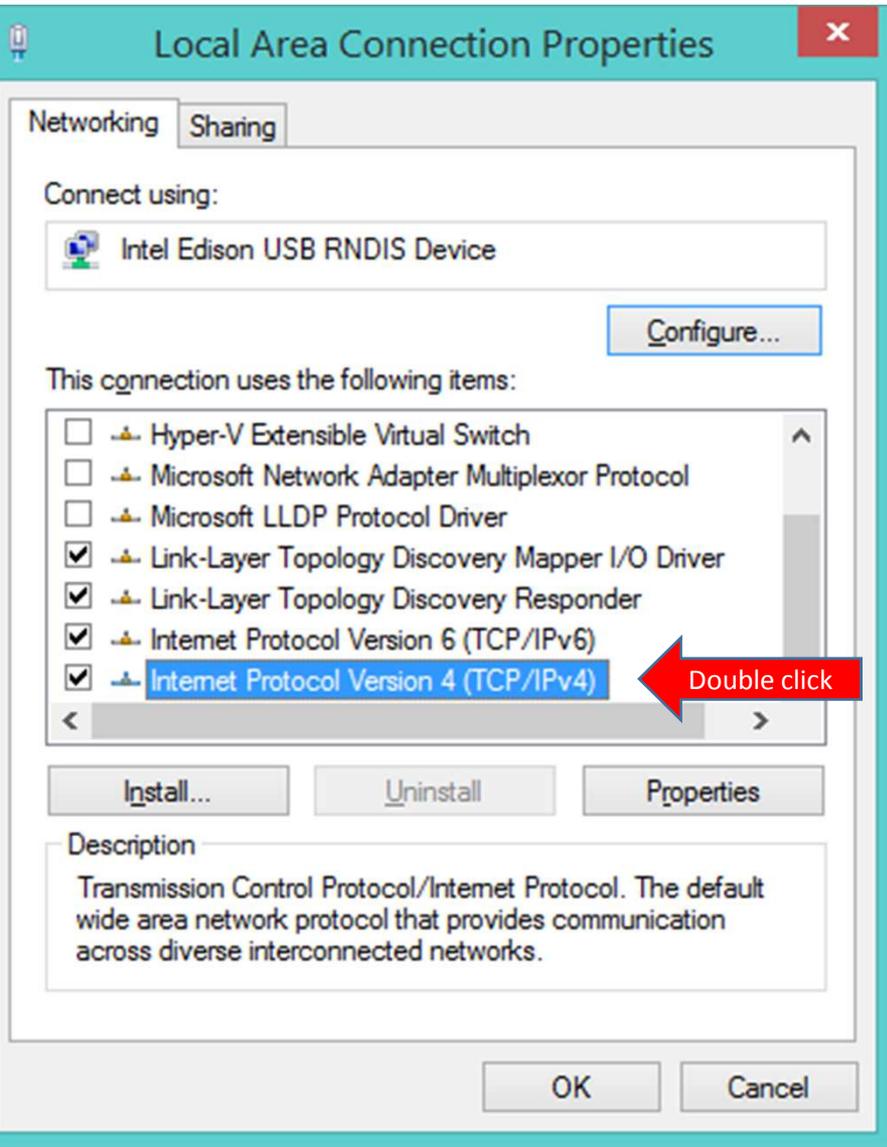
# Instructions for Windows

View your Network Connections, as follows:

- In Windows 7 and below, go to the Control Panel. Under **Network and Internet**, click **View network status and tasks**. Click **Change Adapter Settings** in the sidebar.
- In Windows 8, right-click the Windows Start menu button and select **Network Connections**.



# Set IP Address



Local Area Connection Properties

Networking | Sharing

Connect using:

Intel Edison USB RNDIS Device

Configure...

This connection uses the following items:

- Hyper-V Extensible Virtual Switch
- Microsoft Network Adapter Multiplexor Protocol
- Microsoft LLDP Protocol Driver
- Link-Layer Topology Discovery Mapper I/O Driver
- Link-Layer Topology Discovery Responder
- Internet Protocol Version 6 (TCP/IPv6)
- Internet Protocol Version 4 (TCP/IPv4)

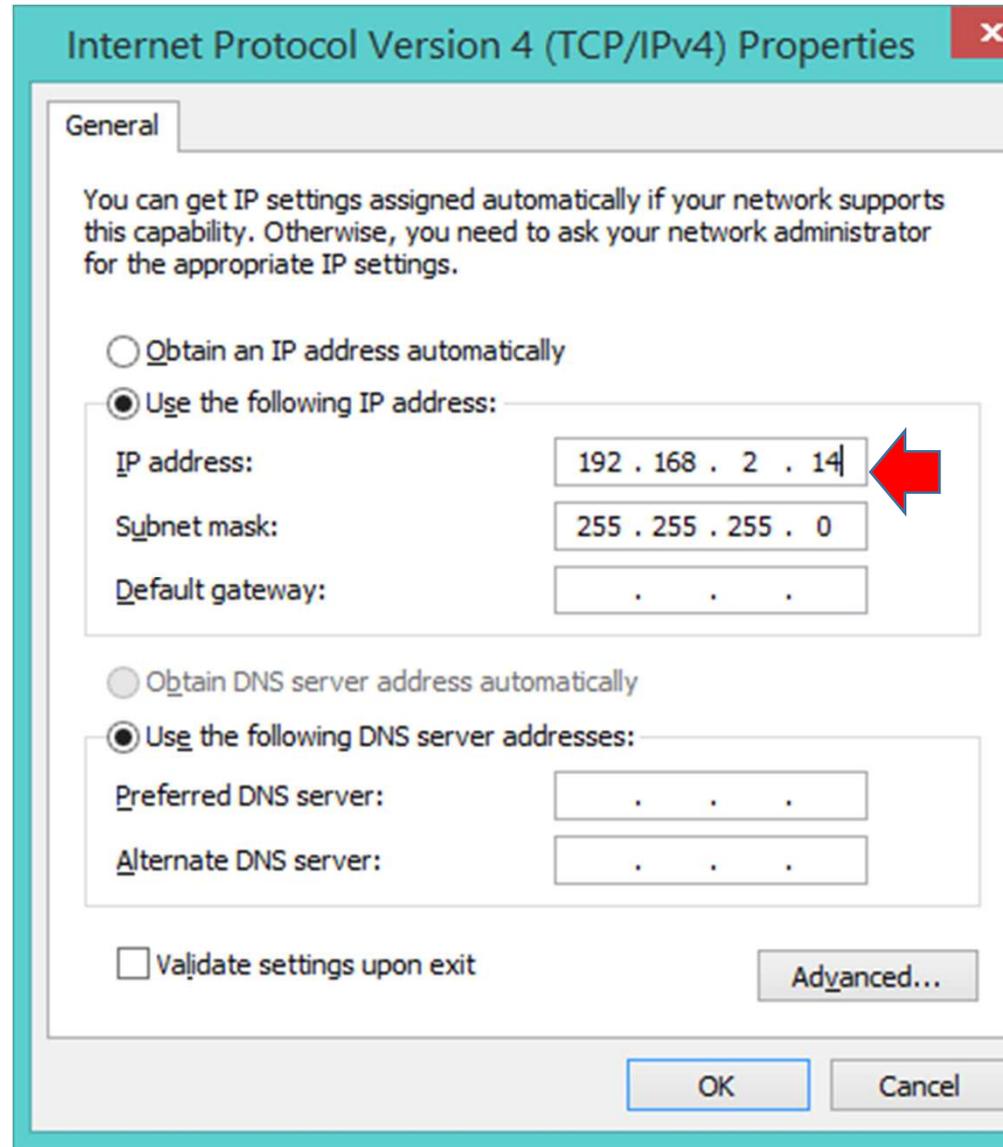
Install... | Uninstall | Properties

Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

OK | Cancel

A red arrow points to the "Internet Protocol Version 4 (TCP/IPv4)" entry in the list, with the text "Double click" next to it.



Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

Obtain an IP address automatically

Use the following IP address:

IP address: 192 . 168 . 2 . 14

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

Obtain DNS server address automatically

Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

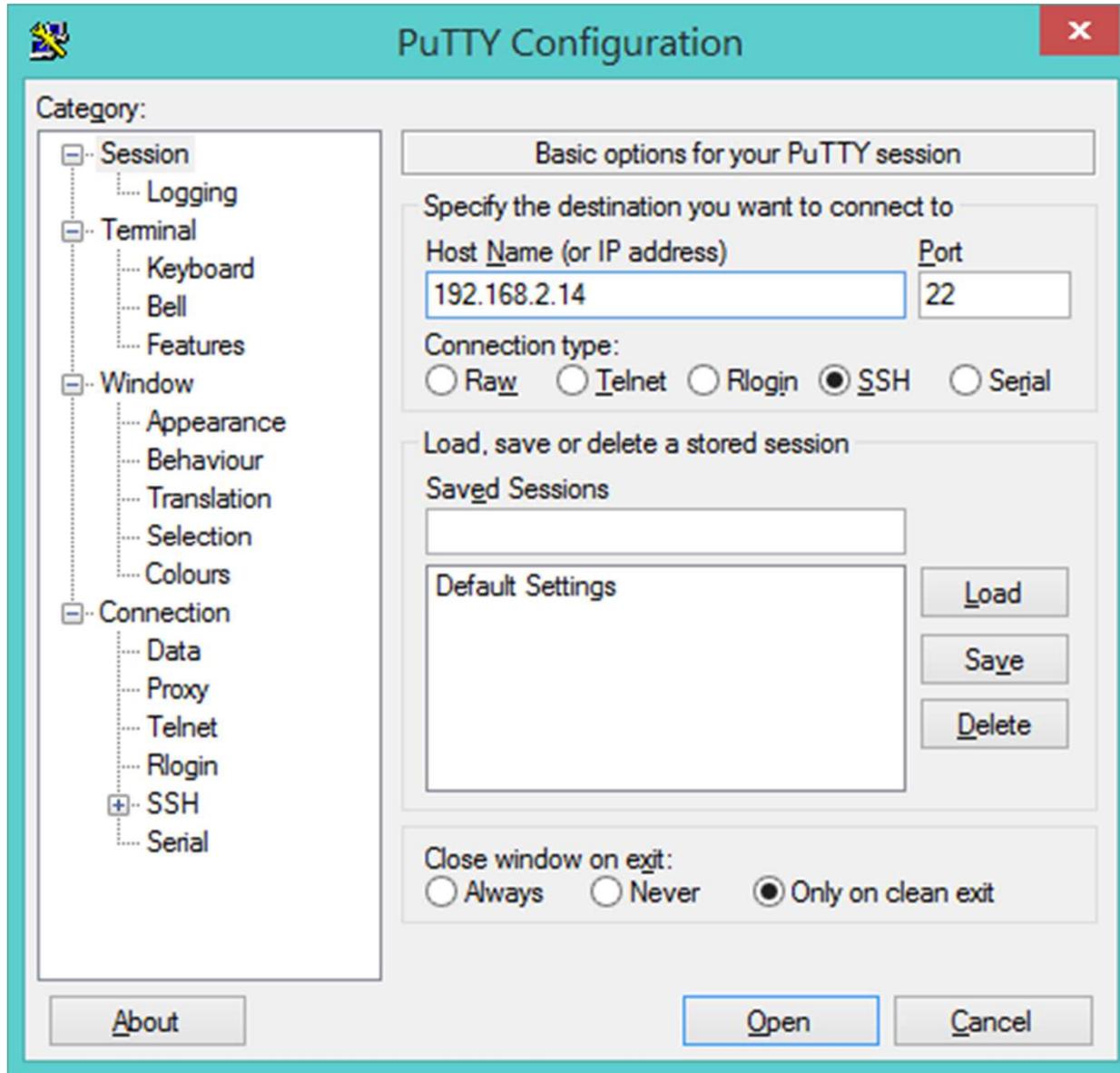
Validate settings upon exit

Advanced...

OK | Cancel

A red arrow points to the IP address field, which contains "192 . 168 . 2 . 14".

# Using PuTTY SSH to Connect Edison Board



Use root as  
user name  
No password

# Connected

```
root@root1:~# ls
0.10.35          ip.py           node_modules    run-our-code.sh
ArduinoFiles    main.js         otp.bin         run.sh
root@root1:~# ifconfig
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:4964 errors:0 dropped:0 overruns:0 frame:0
                TX packets:4964 errors:0 dropped:0 overruns:0 carrier:0
                collisions:0 txqueuelen:0
                RX bytes:377300 (368.4 KiB)  TX bytes:377300 (368.4 KiB)

usb0            Link encap:Ethernet  HWaddr ee:22:9c:e7:7b:49
                inet addr:192.168.2.15  Bcast:192.168.2.255  Mask:255.255.255.0
                inet6 addr: fe80::ec22:9cff:fee7:7b49/64 Scope:Link
                UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
                RX packets:248 errors:0 dropped:0 overruns:0 frame:0
                TX packets:102 errors:0 dropped:0 overruns:0 carrier:0
                collisions:0 txqueuelen:1000
                RX bytes:41413 (40.4 KiB)  TX bytes:20759 (20.2 KiB)

wlan0           Link encap:Ethernet  HWaddr 78:4b:87:a2:bb:40
                inet addr:192.168.42.1  Bcast:192.168.42.255  Mask:255.255.255.0
                inet6 addr: fe80::7a4b:87ff:fea2:bb40/64 Scope:Link
                UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
```

File Edit View Window Help



Quick Connect Profiles

```
root@root1:~# configure_edison --wifi
```

```
Configure Edison: WiFi Connection
```

```
Scanning: 1 seconds left
```

```
0 : Rescan for networks
1 : Exit WiFi Setup
2 : Manually input a hidden SSID
3 : 8912
4 : ChinaNet
5 : QZhotel
6 : 8913
7 : 1007
8 : 1011
9 : 8905
10 : 8907
11 : 8909
12 : Ahli
13 : mengxiangjia
14 : pink bowl
```

```
Enter 0 to rescan for networks.
Enter 1 to exit.
Enter 2 to input a hidden network SSID.
```

Not connected - press Enter or Space to connect

79x26

File Edit View Window Help



Quick Connect Profiles

```
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:372 errors:0 dropped:0 overruns:0 frame:0
TX packets:341 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:50425 (49.2 KiB) TX bytes:75651 (73.8 KiB)

wlan0 Link encap:Ethernet HWaddr 78:4b:87:a2:bb:40
       inet addr:192.168.43.199 Bcast:192.168.43.255 Mask:255.255.255.0
       UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
       RX packets:18 errors:0 dropped:0 overruns:0 frame:0
       TX packets:65 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:2433 (2.3 KiB) TX bytes:13017 (12.7 KiB)

root@root1:~# ./run.sh
I, [2015-07-19T22:43:20.826Z] INFO -- : [EdisonRobot] - Initializing connections.
I, [2015-07-19T22:43:21.301Z] INFO -- : [EdisonRobot] - Initializing devices.
I, [2015-07-19T22:43:21.335Z] INFO -- : [EdisonRobot] - Starting connections.
I, [2015-07-19T22:43:21.344Z] INFO -- : [EdisonRobot] - Starting devices.
I, [2015-07-19T22:43:21.377Z] INFO -- : [EdisonRobot] - Working.
Cylon robot work called.
Web Service connected to Robot
Connected to the Arduino program.
Robot creating connection
root@root1:~#
```

# Final Project: Competitions

1. EV3 Wall Following Maze with driving error correction
2. EV3 Two-Distance Maze algorithm with rotating head
3. EV3 Line-Following
4. Edison Robot Remote Control, use your own Edison Robot
5. Edison robot Two-Distance Maze algorithm, using your own or Instructor's robot