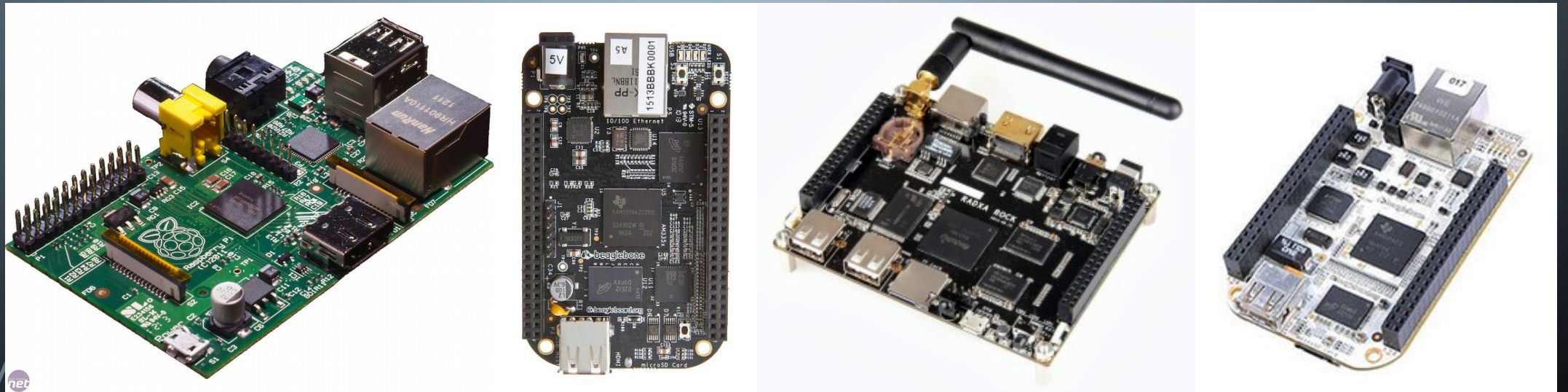


# SINGLE BOARD COMPUTERS

-KEVIN JOSE



# WHY DO WE USE THEM?

- Good performance at low price
- GPIO capability to interact with the outside world
- Small form factor, portable
- Relatively low power consumption
- Wide range of products available with varying capabilities
- Tremendous community support available for most boards
- Hackable!

# SOME DISADVANTAGES...

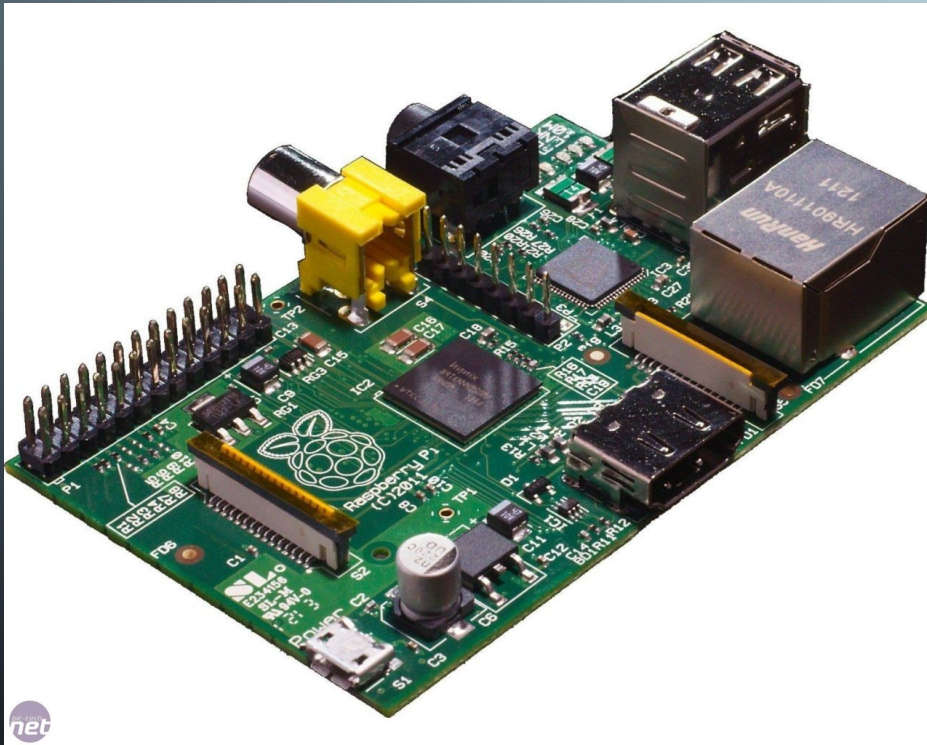
- Usually quite fragile (electrically)
- GPIO output power constraints on some boards
- The processor is usually ARM and so there for cannot run x86 architecture based OSes like Windows and some Linux distros
- The performance of these boards does pale in comparison to modern consumer desktops or laptops

# RASPBERRY PI

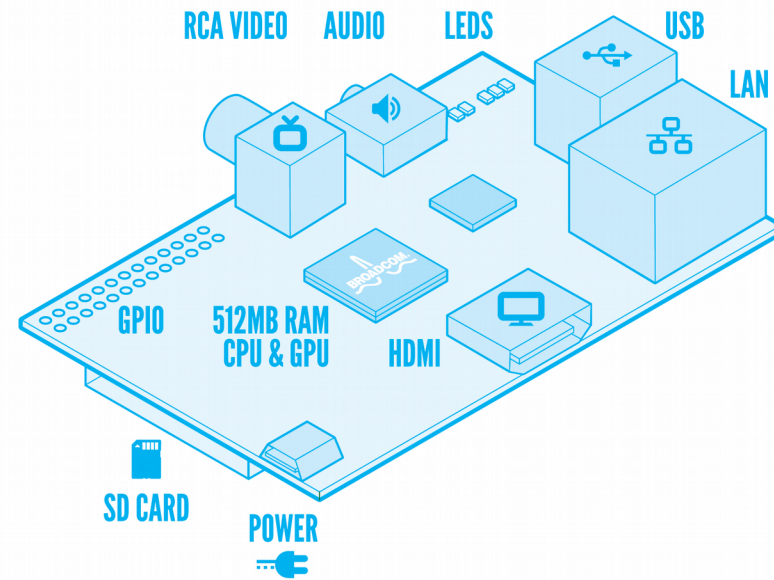
The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools.

Makers and tinkerers, being who they are, adapted the Pi to act as a tiny computer that they can easily embed into their projects.

# BOARD LAYOUT



## RASPBERRY PI MODEL B



# GETTING STARTED

- Prepare the SD card
  - 1) Format the SD card using **SD Formatter**
  - 2) Download the image file of the OS, I am using **Wheezy**
  - 3) Write the image file of the OS using **Win32DiskManager**

Related links/ References:

- 1) <http://raspi.tv/2012/how-to-make-a-raspberry-pi-disk-image-to-sd-card-with-win32diskimager>
- 2) [https://www.sdcard.org/downloads/formatter\\_4/eula\\_windows/](https://www.sdcard.org/downloads/formatter_4/eula_windows/)

# I DO NOT HAVE A MONITOR TO SPARE! ...USING SSH

- Communicate with the Raspberry Pi by **SSHing** into it from your laptop using **PuTTY**
- **Xming** allows us to use graphical applications also
- Assign static IP to Raspberry Pi which is similar to the IP of your laptop by editing the **cmdline.txt** file in **boot** directory, reboot
- IP address of your Rpi can be checked with the command “**hostname -I**”
- The link given below is highly recommended

Related links/ References:

1) [https://pihw.wordpress.com/guides/direct-network-connection/comment-page-1 /](https://pihw.wordpress.com/guides/direct-network-connection/comment-page-1/)

# TRANSFERRING FILES TO THE RPI FROM WINDOWS

- Use **WinSCP** to transfer(upload) files to the Raspberry Pi via the Ethernet cable
- Setup similar to that of PuTTY, file protocol: SCP

Related links/ References:

1) <http://sourceforge.net/p/raspberry-gpio-python/wiki/Home>



# RPI'S WINDOW TO THE WORLD: GPIO

- GPIO stands for General Purpose Input/Output
- GPIO pins can be used to communicate with sensors other than usual computer peripherals
- Raspberry Pi has 8 configurable I/O pins, it also has pins capable of communicating via SPI or I2C protocol
- Rpi's GPIO pins are infamous for their **inability to supply large currents**, some pins can supply a maximum of 16 mA by some conservative estimates! Proper research must be done before connecting components to the GPIO pins and care must be taken to avoid any shorting

# SETTING UP AND USING THE GPIO PINS

- GPIO pin manipulation may not be active by default on Wheezy
- Need the Python library **Rpi.GPIO** to enable it
- Check if Rpi.GPIO is already installed by running python on the terminal (as root user) and importing Rpi.GPIO by command **"import Rpi.GPIO"**
- If it imports alright, check version by running command **"Rpi.GPIO.VERSION"**
- Use 0.5.5 version
- If it is not installed, update and upgrade RPi with commands: (you need to be connected to the internet)  
**"sudo apt-get update"**  
**"sudo apt-get upgrade"**
- Actual usage explained in the demo

Related links/ References:

1) <http://sourceforge.net/p/raspberry-gpio-python/wiki/Home/>

# USING INTERNET ON RPI ON IITK LAN

- Wheezy lacks a GUI to change the static IP settings to use IITK Ethernet for internet
- Need to do it from the command line. A file needs to be changed:
- Navigate to “**/etc/network**” and change the eth0 part in “**interfaces**” file to:  
“**iface eth0 inet static  
address 192.168.1.10  
netmask 255.255.255.0  
gateway 192.168.1.1  
dns-nameservers 172.31.1.1 172.31.1.130**”
- Insert appropriate numbers

Related links/ References:

1) <http://www.raspberrypi.org/forums/viewtopic.php?f=63&t=5738>

This lecture could not have been possible without the resources provided by the creators of RaspberryPi VI Beginners website and YouTube channel (amongst others listed in the slides):

- 1) <http://pibeginners.com/>
- 2) <https://www.youtube.com/user/RaspberryPiBeginners>

Strongly recommended for absolute beginners!

The image features a dark blue gradient background with white circuit board patterns in the corners. The patterns consist of lines and circles, resembling a PCB layout. The text "THANK YOU!" is centered in the middle of the image.

THANK YOU!