# Invent-O-Pi

Workshop on Design and Development of Raspberry Pi based systems.

The Raspberry Pi: A new sensation in the world of electronics. This ultra low cost and smallest form factor Linux based computer is expected to revolutionize the computing world. Pi can be used to play games or control robots or act as a media centre with AirPlay. The board is a great educational tool. It is currently being employed in schools for teaching programing and soon going to be part of many engineering projects. Besides this another application where you realise its superpowers when you use it for 'Internet of Things'.
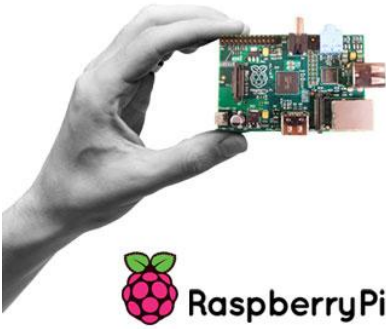
About Raspberry Pi

This is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of stimulating the teaching of basic computer science in schools. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM11 700 MHz processor, Video Core IV GPU, 512MB of RAM. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.
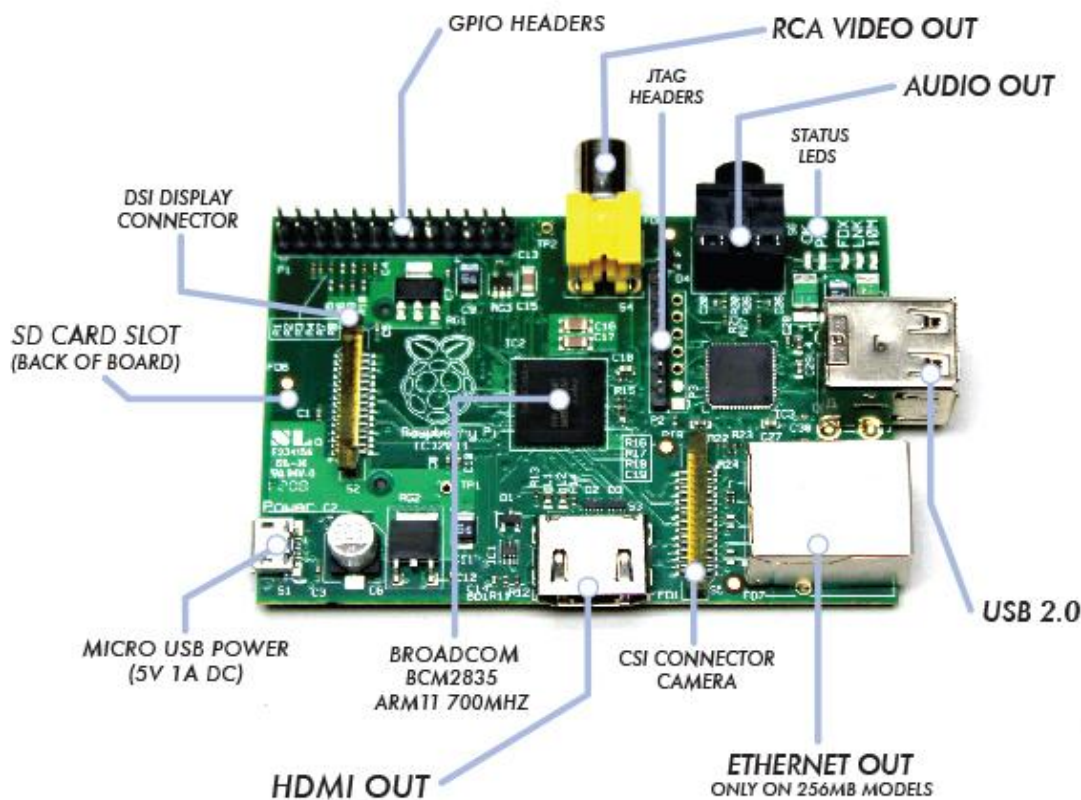
The Raspberry Pi Foundation provides Debian and Arch Linux ARM distributions for download. Also planned are tools for supporting Python as the main programming language, with support for BBC BASIC, (via the RISC OS image or the "Brandy Basic" clone for Linux), C, and Perl.

We are happy to announce that Inventrom brings you a two day workshop on Raspberry Pi where the participants will learn about Embedded Linux Programing and Peripheral Interfacing for a Raspberry Pi platform. They will also perform various basic hands on experiments on the GPIO pins (general purpose I/O) such as O/P control, receiving the sensor input, Interfacing I/O devises such as LEDs, LCDs etc. The participants will also learn to Interface the Wissap wireless sensor as well as controlling a Robot over the Internet.

About the Workshop

At Inventrom, we are happy to say we are one of the first company in India to conduct workshops on Raspberry Pi. We have already conducted this workshop at various institutes like IIT Rorkee, BITS Pilani, Rajasthan Campus, BITS Pilani, Goa Campus, etc.

We believe that one can relate to and understand a technology better; only when one is able to witness the transformation of theoretical knowledge into real world working models. Our brain is motivated to think and invent through the course of practical experimentation.

Keeping this in mind, we have designed the workshop to amalgamate basic theory sessions and understand the advanced applications through hands on practical sessions.

Our agenda for the workshop can be summarized as:

DAY 1

Session 1

Theory, 45 minutes

Getting started with basics

- Introduction to Raspberry Pi

- Hardware Description & Interfacing Components

- ARM 11 Microcontroller

- Brief Introduction to Embedded Linux

Session 2

Practical, 45 minutes

Trying out the tools

- Flashing & preparing the SD card for the Raspberry Pi.

- Booting in Debian Linux

- Hardware Interfacing of PI (HDMI Port, Keyboard-mouse connection, 3.5mm jack, micro use power cable)

Session 3

Practical, 90 minutes

Playing with the OS

- Logging in to Raspberry Pi- Linux LX-Terminal

- Enabling SSH(secure connection) over Raspberry Pi

- Swapping between OS's

- Viewing system Information

Lunch Break
Feast & Siesta , 45 minutes
Because we need to recharge our batteries too!

Session 4

Practice, 90 minutes

Getting hang of Raspian Wizzi

- Debian Linux Basic & Useful commands

- Editing system files, changing system hostname, changing log-In Info

- Mounting devices & Transferring files

- Installing software on Debian – Installing VNC server

- Transferring content over SSH

- Installing Python- Dev, Using RPi.GPIO

- Enabling the Raspberry Pi GPIO Pins

Tea Break
Time for Tea, **Time to refresh!** *30 minutes*

Practical, 60 minutes

Fun with GPIO

- Hardware interfacing to the PI
- LED interfacing with Pi and controlling it over SSH

DAY 2

Session 6

Theory cum practice, 180 minuets

Digesting the Python

- Introduction to Python
- Installing software and downloading packages
- A look at RPI.GPIO, Wiring Pi, Python Dev and Time Libraries
- Difference between writing programs in Python & C over a Linux Machine
- Taking input from Sensors
- Programming an Analog to digital converter
- Programming a motor controller

Session 7

Theory cum practice, 120 minuets

Time to create some awesomeness (Projects)

- LED interfacing to Pi using RPi.GPIO and TIME. (Python and wiring Pi Library in C)
- LCD interfacing to PI displaying temperature over the internet.
- Switch interfacing and interfacing input devices (temp sensor, light sensor)
- Controlling Robot arm over the Network.
- Interfacing Inventrom's Techno Board and Wiseapp to Raspberry Pi.
- Internet of things: Interfacing any wooden door with Raspberry Pi using Inventrom's Wissap to send an E-Mail when it is opened.
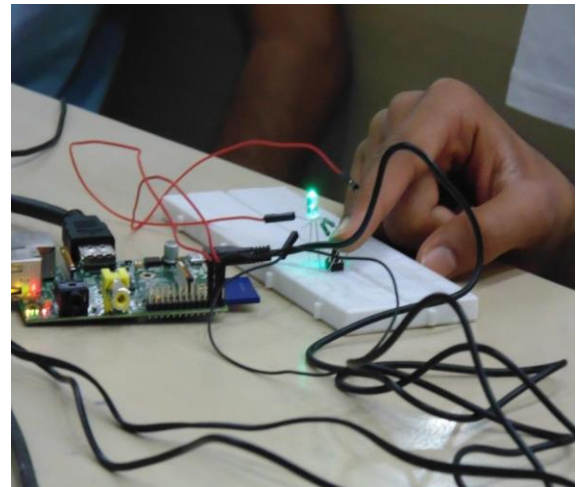
Hardware to be used for the hands-on sessions:

- Raspberry Pi Board

- Techno Board & Sensor Nodes: **Wissap by Inventrom**

- Programmer: **Zazu Wireless Programmer by Inventrom**

Note: Hands on session with Raspberry Pi to be conducted over SSH

SSH is secure shell which runs on windows over a client "putty". This allows a user to get a command line interface of Raspberry Pi or any Unix based system on his/her windows system as if it is directly connected. Thus a single Pi can be shared by multiple users over a network. The SSH tunnel thus established allows a complete hardware access to the user through the local network. This ensures that every participant to gets a hands on experience.
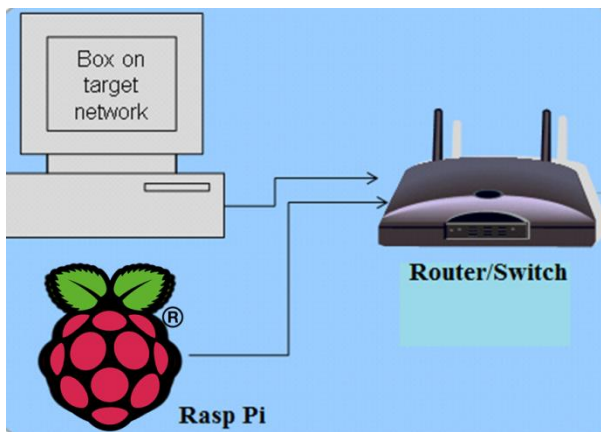
SSH on a windows device

Putty
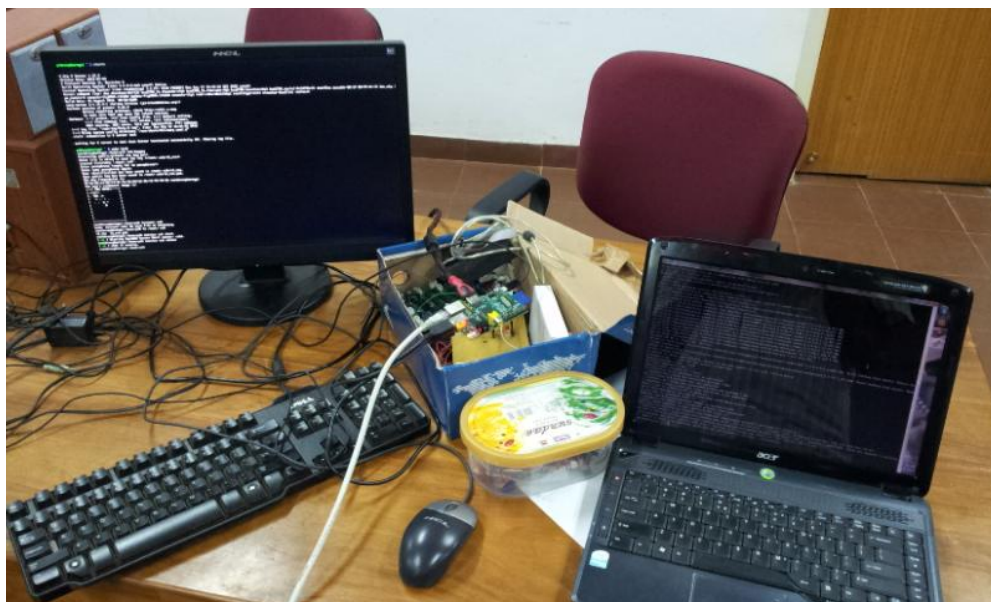
SSH tunnel in action @ Inventrom Lab's

Pre requisites for the attendees

- Basic knowledge of Digital Electronics: Binary and Hex number systems.
- Basic Knowledge of C Programming: If- else conditional, while, for, do while loops, functions.
- Most importantly we hope to see a passion for Arm Microcontroller, embedded systems, willingness to learn, and an inquisitive mind.

The Inventrom kit contents

Each participating team of three members will get a kit containing the following items:

- An 8GB memory card contacting the Raspian Wizzi Image flashed **for each team** of maximum three members each.
- CD containing the following:
    - All the necessary software required for programming of **Raspberry Pi,** essential tutorials and PDF's for each participant**.**
    - All the necessary documentation, header files and help files.
    - Tutorial and other relevant videos.
    - Sample Editable Codes.
- **Raspberry Pi** user Manual.
- Certificate of Participation for each participant**.**

Fees

We will charge a nominal fee of Rs.2850/- per team of maximum three students for Inventrom. The organizers can charge any additional amount over and above the fee of Rs.2850/- towards organizational costs if required.

Minimum Batch Size

We would require a minimum of 10 teams of maximum 3 members per batch. There is no upper limit on the batch size.

About us

We are an electronic technology company with primary focus on robotics and wireless devices. We believe that in today's times Robotics is one of the most interesting ways to ease lifestyle and make the world a better place. We want to make the world of Robotics more accessible and useful to the common man. Our main focus is on the R&D of technology that can inspire to invent.

We are a team of young engineers who have a passion for all stuff that is geek and related to robotics and wireless technology. The most commendable accolade for our research is the grant of patent **No. 2581/MUM/2012 (Provisional) by Government of India for the Zazu wireless programmer** designed and developed by us. Besides this, our highest selling product of all times is the **TechnoBoard**, an AtMega 32 based development board along with the **Wissap** –Wireless sensor node.

We have to our credit an experience of four years in conducting workshops at esteemed institutions such as IIT Roorke, BITS Pilani Goa and Pilani Campus whereas our corporate clientele includes reputed firms such as TCS, Chowgule etc. We have continuously received overwhelmingly positive response from the students, hobbyist and researchers by means of feedback and testimonials. As a part of our CSR, we also have been conducting beginner sessions for school kids on Robotics by going to various schools free of cost to spread the knowledge of the same. We hope that this will amuse and inspire them to work hard and complete their education successfully.

Robolife Advanced

Invent-O-Pi (IIT Roorke)

Infrastructure Requirements

- **LCD projectors**
  We will require an LCD projector with a good brightness and contrast for displaying the slides.

- **Display with HDMI or DVI connectivity**
  We preferably require a projector HDMI/DVI Input for displaying the functioning of the Raspberry Pi. We will also require at least two projectors/monitors/display screen with HDMI/DVI slots. We may require more projectors/monitors/display screen if the number of students increase. We shall let you know the exact number once you inform us the tentative number of participants.
  For any clarification on the connectors you may visit en.wikipedia.org/wiki/HDMI

- **Computer**
  One PC per team. The participating team could also carry their own laptop

- **PC Configuration**
  Intel Dual Core Processor with minimum of 1 GB RAM with at least 10 GB of free Hard Disk space. PCs must be virus free. The PCs should have USB ports. Operating system: Windows XP or Windows 7. **The PC or Laptop should have full Ethernet facility with internet speed of at least 100kbps.** The PC should be able to run PUTTY and WinSCP 5.1.2 software. Both of these are free softwares.

- **Network connectivity**
  Working LAN connecting all the PC's in the Lab (1MBPS Line). Working Internet connection to all the PC's with least 100KBPS line.

- **Theory Session**
  Theory session can be preferably conducted in a classroom with good quality LCD projector or they at the same place as that of the "Hands on Session".

- **Hands on session**
  In this session, participants will be expected to write programs and execute them on the sensor nodes. Hands on session should be conducted in place where all the participating teams can see the LCD projector very clearly while sitting in front of the PC.

- **Miscellaneous**
  It is extremely important that all the PCs must be virus free and there antivirus program is up to date. Virus infected PC's cause lots of problems during hands on sessions.
  Lab in which workshop is conducted should have sufficient cooling capacity so that all the participants will be comfortable.
  If there are power outages because of load shedding then all the PC's should have UPS backup.

- **Mode of Payment**
  All the payments need to be done in cheque/ DD/ online transfer before the start of the workshop. The receipt of the payment will be provided to the organizers. Delay or failure of payment will not be entertained.

For more information and to organise a workshop at your institute feel free to write to us at
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We look forward to meeting you at the workshop,

Team Inventrom

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