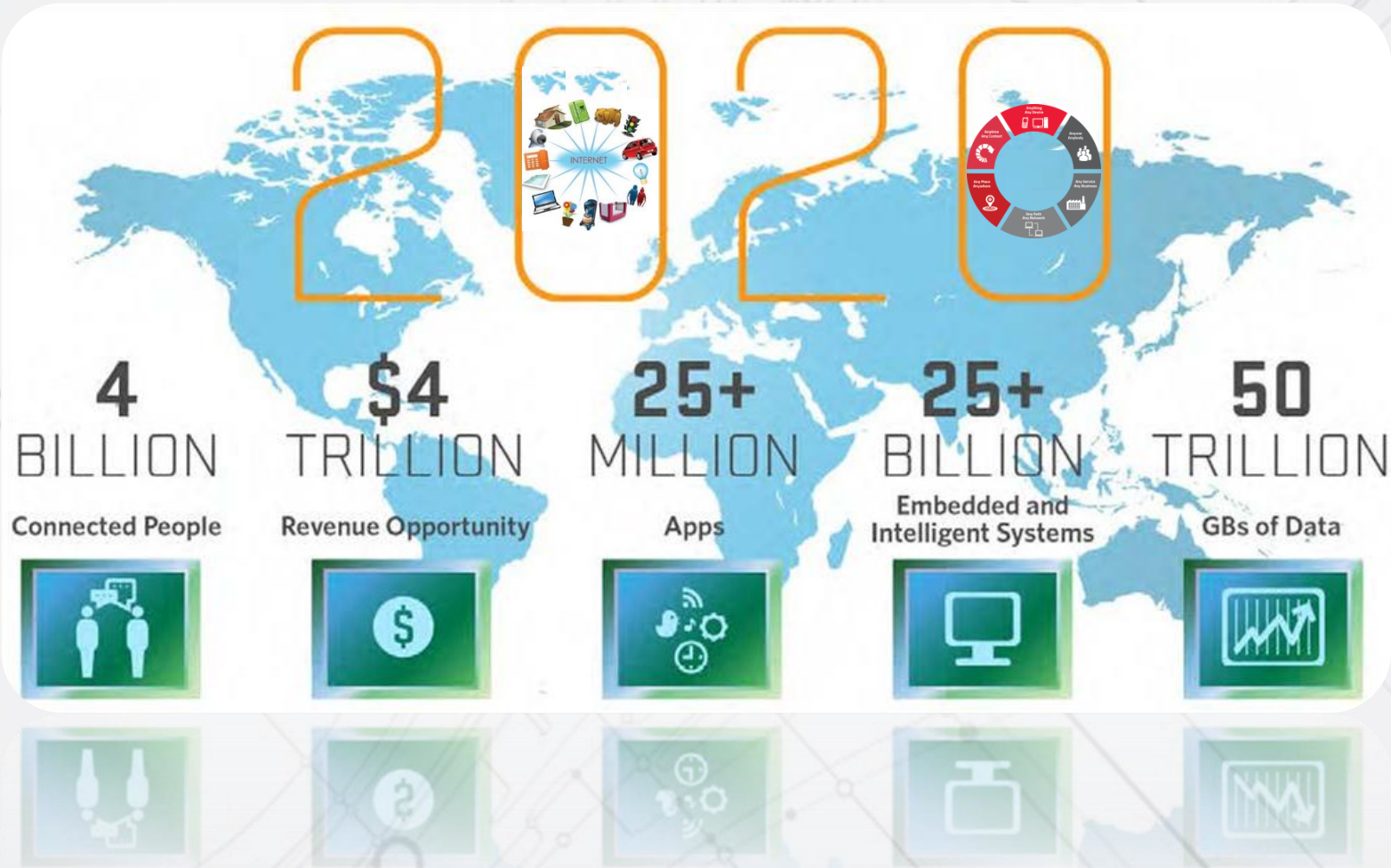
Internet of Things

Connect the World: Connect Anything, Anytime, Anywhere



"The principal goal of education is to create men and women who are capable of doing new things, not simply repeating what other generations have done."

-Jean Piaget

Internet of Things (IoT) - the convergence of physical things with the world of the internet is a big buzz phrase now in the tech industry which people also considering as the fourth industrial revolution. In IoT objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically IoT means to the everyday objects, ones that we interact with regularly, will be capable of 'talking' to each other. Humans will fall more and more out of the loop. Machines will be talking to machines, objects talking to objects. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet.

A **thing**, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low, a refrigerator that orders supplies automatically when it is low, an oven that starts heating your breakfast once your shower stops, -- or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network. So far, the Internet of Things has been most closely associated with machine-to-machine (**M2M**) communication. Products built with M2M communication capabilities are often referred to as being smart.

At this year's Consumer Electronics Showcase opening keynote, **Samsung** announced that 90% of all its devices would focus on the Internet of Things movement by **2017**. Five years from now, all of Samsung's products will fall into IoT category.

Gartner recently forecast "In **2020** there will be up to **30 billion devices** connected to the Internet most of which will be products", up from 2.5 billion in 2009. They further predict "that the total economic value add for the Internet of Things will be **$1.9 trillion dollars in 2020**."

The revolution in the field of IoT has been started, Technophilia R&D team through this workshop providing you an opportunity to learn, work, develop IoT products on your own or make your existing things connected & smart.

What would you learn?

- Revolution in the field of IoT
- Visual Basic programming to perform serial communication with Microcontroller & Things
- Understanding IP addressing & networking
- Designing ASP page & hosting website to display Things status update
- Designing offline database & uploading it to store & retrieve things status & perform automatic operations
- Learn to create online MySQL database & perform operations on it
- Role of popular hardware used in IoT development, their details & programming: Raspberry Pi & Arduino
- Understanding microcontrollers used in embedded systems & their programming using Embedded C
- Wireless devices used in IoT & their interfacing
- Interfacing technique of different automation devices & tools e.g. Sensors, Motors, Actuators, Relay etc to make the things smart & communicate one another
- Build **Internet Controlled Robot/Anything** which you can control/monitor from **anywhere** at **anytime**

DETAILED COURSE CONTENT:

Session 1: (4hrs)

Introduction to IoT:

- Introduction to Internet of Things (IoT)
- Why IoT? How IoT is changing the world?
- Applications of IoT: environmental monitoring, industrial & home automation, transport, medical etc
- System components of IoT:
  - The Thing
  - The Local Network/Sensor Network
  - The Internet
  - The cloud

Hardware overview of IoT:

- The Arduino platform, its programming concepts & how to connect it to Internet
- The Raspberry Pi platform, its programming concepts & how to connect it to Internet
- Different sensors used & their interfacing techniques
  - Light sensors: LDR, photo diode, IR etc
  - Sound: microphones, ultrasonic sensors etc
  - Motion: potentiometer, acceleration sensor, gyro sensor etc
- Wireless modules & their interfacing techniques
  - Bluetooth
  - IR
  - Wifi
  - ZigBee

Session 2: (4hrs)

Understanding Microcontrollers & its programming using Embedded C:

- Need of microcontrollers, classifications & selection criteria for different automated applications
- Understanding DDR, PORT, PIN registers of AVR microcontroller & writing I/O codes in embedded C
- Basic I/O device interfacing:
  - LED
    - Glowing of LEDs
    - Blinking of LEDs
    - Running of LEDs
  - Switch
    - Circuit/connection details of the switches
    - Development & testing of various switch based programs
  - Sensor
    - Understanding the working of Multi-Purpose Optical Sensor (MPOS) & its uses with Things
    - Development & testing of various sensor based applications

Session 3: (3hrs)

Exploring Visual Basic Programming & developing PC based IoT VB App:

- Understanding the Visual Basic programming environment & syntax of writing program
- Steps of developing VB applications
- Working with different tools from the tool box
- Designing IoT VB application to interact with the Things & web application/website
- Creating stand-alone VB Applications
- Performing serial communication between PC & microcontroller using UART

Session 4: (5hrs)

Developing IoT Web App:

- Understanding web architecture
- Understanding use of web requests e.g. GET, POST, REST etc
- IP addressing: IPV4, IPV6, subnet mask etc
- HTML basics
- HTML Tags
- Creating a simple Web page
- Creating an ASP page
- Creating MS Access database
- Hosting the ASP page & Database on web server
- Performing insert & update operation on the data base
- Creating online data base using MySQL
- Performing operations on online database
- Controlling Things or hardware devices over Internet using the Web App

Cloud based IoT solutions:

- theThings.io
  - The Internet of Things SDK
  - theThings.IO APIs
  - Understanding how to create Arduino & Raspberry Pi based IoT products/Apps & connect to Internet
- IFTTT: If THIS Then THAT
  - Introduction to IFTTT
  - Creating account, enabling channels, dashboard details
  - Creating IFTTT recipes & integrating Facebook, Tweeter, Gmail etc:
    - Download new Facebook photos you are tagged into Dropbox/post on tweeter/send mail
    - Be notified if it's raining tomorrow
    - Mute my phone when I leave home
    - Alert when temperature drops
    - Turn on lights 15 before sun set

The Training kit contents:-

1. Microcontroller development board with the following features: (1)

- Built with popular Atmel's AVR Microcontroller
- On-board LCD interface option (it can also be used for any other general purpose application)
- Option of Motor Driver for connecting 2 DC motors or 1 Stepper motors
- On-board 5v regulated power supply
- Onboard 12MHz external crystal connection
- Onboard 2-tact switches for external input and reset
- Onboard 4 test LEDs for status and debugging purpose
- Onboard 2 supply indicator LEDs
- Onboard dual power supply option through DC source (6V to 16V) or USB power
- On board USB programming feature
- Onboard exposed ISP pins for ISP programming
- Onboard exposed I/O pins
- Onboard exposed I/O pins for ADC and sensors with 5V/1A power supply

2. Max232 module (1)
3. Digital Multi-Purpose Optical Sensor (MPOS) (1)
4. Serial Cable (1)
5. USB to Serial converter (BAFO) **Non-Takeaway** (1)
6. USB cable (1)
7. Batteries for power supply (1)
8. Battery Snappers (1)
9. Sensor Connectors/cables (2)
10. CD containing study materials, sample codes, software, videos etc (1)

Duration: We conduct a workshop on 2 consecutive days, each day 8 hour's session, so in total 16 hours properly divided into theory and hands on sessions.