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IOT

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Internet of Things

It is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.

Internet technology connecting devices, machines and tools to the internet by means of wireless techno0logies.

Over 9 billion 'things' connect3ed to the internet as of now.

Things connected to the internet are projected to cross 20 billion in the near future.

Unification of technologies such a lower- power embedded systems, cloud computing, gig-data machine learning and Nonworking.

ORIGIN OF TECHNOLOGY: -

In the 2000s, we are heading into a new ear of iniquity, here the users of the internet will be counted in billions and where humans may become the minority as generations and receivers of traffic, instead must of the traffic will flow between devises and all kinds of things. Thereby creating a much wider and more complex internet of things.

CHARACTIRISTICS: -

Efficient, Saleable and associated architecture.
Unambiguous naming and addressing.
Abundance of sleeping nodes, mobile and non-IP devices.
Intermittent connectivity.

IoT Market Share: -

Business/Manufacturing-

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Real time analysis of supply chains and equipment, robotic machinery.

Health Care: -

Portable health monitoring, electronic recovering record keeping, pharmaceutical safeguards.

Retail: -

Inventory tracking, smarty phone purchasing, anonymous analytic of consumer choices.

Security: -

Biometric and facial cognition locks, remote sensors.

Evolution of connected Devices: -

ATM-

These ubiquitous money dispensers want online for the first time way back in 1974.

WEB-

World wide web mode its debut in 1991 to revolutionize computing and communications.

SMART METERS-

The first power meters to communicate remotely with the grid were installed in the early 2000s

DIGITAL LOCKS-

Smartphone can be used to lock and unlock doors remotely, and business owners can change key codes rapidly to grant or restrict access to employees and guests.

SMART HEALTHCARE-

Devices connect to hospitals, doctors and relatives to alert them of medical emergencies and take preventive measures.

SMARTY VEHICLES-

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Vehicles self-diagnose themselves and alert owners about system failures.

SMART DUST-

Computers smaller than a grain of sand can be sprayed or injected almost anywhere to measure chemicals in the soil or to diagnose problem, in the human body.

BASELINE TECHNOLOGIES: -

A number of technologies that are very closely related to IoT include: -

Machine-to-Machine (M2M communications
Cyber-Physical- systems (CPS)
Web-if-Things (WoT)

IoT v/s M2M

M2M refers to communications & instructions between machines' & devices'

Such retractions can occur via a cloud computing infrastructure (e.g. Devices exchanging information through a cloud infrastructure).

M2M offers the means for managing devices and devices interaction, while also collecting machine and or sensor data.

M2M is a term introduce by telecommunication services providers and pays emphasis on machines interaction via one or more telecommunication networks (e.g.: - 3G, 4G, 5G, satellite, public networks).

M2M is a part of the IoT while M2M standards have a prominent place in the IoT standards landscape.

However, IoT has a border scope than M2M, since it comprises a broader range of interactions including instructions between devises/things, things and people, things with appki9catins and people with applications.

It also enables the composition of work flows comprising all of the above instructions.

IoT include the notion of internet connectivity (Which is provided in most of the network, outlined above). but is not unnecessary focused on the use of te4lecome networks.

IoT v/s WoT

From a developer's perspective, the WoT enables access and control over IoT resources and applications using mainstream web technologies (Such as HTML 5.0, JavaScript, Ajax, PHP, Ruby and Rails etc.)

The approach to building WoT is therefore based on restful principles, and REST Api's, which enables both developers and deploys to benefit form the popularity and maturity of web technologies.

Still, building the Wot has various scalability, security, etc., challenges, specially as part of a road-map toward a global WoT.

While IoT is about crating network of object s things people systems and applicants, WoT tries to integrate them to the web.

Technically speaking WoT can be thought as a flavor /option of an application layer added over the IoT's network layer. However, the scope of IOT applications is broader and includes systems that are not accessible through the web (e.g. conventional Swen and RFID systems).

Modern Day IoT Applications: -

Smart Parking	Radiation Level
Structural Health	Explosive and Hazardous Gases
Noise Urban Maps	Supply Chain Control

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Smartphone Detection	NFC Payment
Traffic Congestion	Intelligent Shopping Applications
Smart Lighting	Smart Product Management
Waste Management	River Floods
Smart Roads	Tank Level
Forest Fire Detection	Photovoltaic Installations
Air Population	Silos Stock Calculation
Snow Level Monitoring	Water Flow
Landslide and Avalanche Prevention	Smart Grid
Earthquake Early Detection	Parameter Access Control
Water Leakages	Liquid Presence

Exercise 1: LED 'on' Project

Component required:

I) Arduino UNO Board
II) One Red LED
III) Arduino USB Cable

Steps to Follows:

I) Connect +ve of LED on i3 pin on Arduino & -ve of LED on GND.
II) Run Arduino software
III) Create sketch for LED project
IV) Connect the USB cable with Arduino & Computer.'
V) Click on updated Option to downloaded the program in Arduino

Program:

```
Void setup ()
        {
        pinMode (i3, OUTPUT);
        }
        . void loop ()
        {
        DigitalWrite (i3, HIGH);
        }
```

Exercise 2: LED 'Blink' Project

Components Required:

I) Arduino UNO Board
II) One Red LED
III) Arduino USB Cable

Steps to Follow:

I) Connect +ve of LED on i3 Pin on Arduino & -ve of LED on GND.
II) Run Arduino Software.
III) Create sketch for LED Project
IV) Connect the USB cable with Arduino & Computer.
V) Click on Upload Option to download the program in Arduino.

Program:

```
        Void setup ()
{
pinMode (i3, OUTPUT);
}
Void loop ()
{
digitalWrite(i3, HIGH);
delay(2000);
digitalWrite (i3, LOW);
```

```
delay(2000);
}
```

Exercise 3: Integrating Temp & Humidity sensor and reading Environmental values.

Component Required:

I) Arduino UNO Board
II) DHT 11 (Temp. & Humidity Sensor)
III) Arduino USB cable
IV) 4.7K ohm Resistor
V) Breadboard
VI) Jumpers Wire M-M

Steps to Follow:

I) Connect DHT11 on E10 to E13 where pin1 of DHT11 on E10 and pin4 of DHT m on E13.
II) Connect a 4.7k Ohm resistor between B10&B11 of breadboard (Between VCC & Data Pin of DHT11)
III) Connect jumper wire b/w A13 of breadboard & GND of Arduino.
IV) Connect jumper wire b/w A11 of breadboard to Pin5 on Arduino.
V) Connect jumper wire b/w A11 of breadboard to +5v on Arduino.
VI) Import Library for DHT lib in Arduino IDE software.
VII) Open Sketch for DHT11 Test in DHT lib Examples in Arduino IDE.
VIII) Connect the USB cable with Arduino & computer and then upload the program.
IX) Open the Serial communication window and check the values.

Exercise 4: Reading Environmental Value on Arduino Smartphone.

Component Required:

I) Arduino UNO Board
II) DHT11 (Temp & Humidity Sensor)
III) Arduino USB Cable
IV) HC-05 (Bluetooth Module)

V) 4.7k Ohm Resister
VI) 2.2k Ohm Resister
VII) 1K Ohm Resister
VIII) Breadboard
IX) Jumper wires M.M

Steps to Follows:

I) Please follow the same steps form step 1 to 4 of the project based on Reading Environmental values.
II) Connect a jumper between A10 of breadboard to +ve terminal of breadboard.
III) Mount the HC-05 Bluetooth Module between J25 to J30 where in STATE pin on J25& EN Pin on J30.
IV) Connect a 2k Ohm resistor between J26 D26.
V) Connect a 1k Ohm resistor between H26 & D26.
VI) Connect a Jumper Wire between (GND) of Arduino to H28 of breadboard.
VII) Connect jumper between G27 to Rx (Pin10) on Arduino.
VIII) Connect jumper between C26 to Tx (Pin) join Arduino
IX) Connect jumper Wire between G29 to +ve terminal of Breadboard.
X) Connect jumper +ve terminal of breadboard to 5v of Arduino.
XI) Open sketch for Arduino - DHT11 in Arduino IDE.
XII) Connect the USB cable with Arduino & Computer.
XIII) Click on upload option to download the program in Arduino.

Note: - While downloading the program please disconnect the Rx & Tx jumper wire from Arduino Board. Once you finish with the download then re connect the Rx & Tx Jumper wire.

XIV) Download the Arduino App form Google play store in your android smartphone.
XV) Run the android app in your android smartphone.
XVI) App will also you to enable the Bluetooth allow it.

Search for your Bluetooth device HC-058 (Group No.) once connected Red LED on Bluetooth module will blink once per second instead of fast blinking.

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Exercise 5: Voice Control Home Automation.

Component Required: -

I) Arduino UNO Board.
II) HC-05 Bluetooth Module
III) Three LEDs (RED, Yellow & Green)
IV) One 1k Ohm Resisters.
V) One 2k Ohm Resistor.
VI) Arduino USB cable
VII) Breadboard
VIII) Jumper wires M-M.

Steps. To Follow:

I) Connect -ve of Red LED on C9 & +ve on C10.
II) Connect -ve of Yellow LED on C14 & +ve on C15.
III) Connect -ve of Green LED on C19 & +ve on C20
IV) Connect jumper wire b/w -ve terminal of Breadboard (GND) & A9.
V) Connect jumper wire b/w -ve terminal of Breadboard (GND) & A14.
VI) Connect jumper wire b/w -ve terminal of Breadboard (GND) & A19.
VII) Connect a jumper wire form Arduino GND to Breadboard -ve (GND) Terminal strip.
VIII) Connect jumper wire between Arduino Pin13 & D10.
IX) Connect jumper wire between Arduino Pin12 & D15.
X) Connect jumper wir3e between Arduino Pin11 & D20.
XI) Please follow some steps from step3 to step of project based on "Reading Environmental Values on Smartphone".
XII) Open the sketch for Voice-Activation Arduino Program.
XIII) Connect the USB cable with Arduino & Computer.
XIV) Click on upload option to download the program in Arduino.

Note: - While downloading the program please disconnect the Rx & Tx Jumper wire from Arduino Board. Once you finish with the download then reconnect the Rx & Tx. Jumper wire.

XV) Download the AMR-Voice App for Google play store in your Android smartphone.
XVI) Run the AMR-Voice App in your Android Smartphone.
XVII) App will ask you to enable the Bluetooth. Allow it.
XVIII) Search for your Bluetooth device HC-05 (Group No.). Once connect ted RED LED on Bluetooth module will blink once per second instead of fast winking.
XIX) Then control the device for your voice commands on AMR-Voice App.
XX) Voice command to be used= Light on, Light off, fan on fan off, AC on, AC off, everything on, everything off.

Exercise 6: Control Device using Local Host Web Server for Home Automation.

Components Required.

I) Arduino UNO Board
II) Ethernet Shield
III) Three LEDs
IV) 5v Relay Module
V) USB Cable
VI) Breadboard
VII) Ethernet Cable
VIII) Jumper Wires M-M & M-F.

Steps to Follow: -

i) Mount Ethernet Shield on Arduino UNO Properly.
ii) Connect LAN cable with Ethernet shield & Laptop/Router
iii) Connect -ve of RED LED on C9 & +ve on C10
iv) Connect -ve of Yellow LED on C14 & +ve on C15
v) Connect - ve of Green LED on C19 & +ve on C20.
vi) Connect jumper wire between -ve Terminal of breadboard (GND) & A9
vii) Connect jumper wire between -ve Terminal of breadboard (GND) & A19

viii) Connect a jumper wire from Arduino GND (via Ethernet shield) to Bread board -ve (GND) Terminal strip.
ix) Connect jumper wire between Arduino PIN 6 & D10.
x) Connect jumper wire between Arduino PIN 7 & D15.
xi) Connect jumper wire between Arduino PIN 8 & D20.
xii) Connect GND of Arduino to GND(-ve) common Terminal strip of Breadboard.
xiii) Connect I/P of Relay to PIN9 of Arduino.
xiv) Connect +5v of Relay to +5v of Arduino.
xv) Connect GND of Arduino to GND (-ve) Common Terminal Strip of Breadboard.
xvi) Connect Arduino to Laptop via USN Cable.
xvii) Open the Sketch of Home Server in Arduino.
xviii) Find out the IP of Ethernet Module, MAC Address, Gateway IP, Sub-net value and then enter in the program accordingly.
xix) Upload the Program into Arduino.
xx) To check your home server, simply enter he Ethernet Module IP in web browser.

Exercise 7: Being Social on Twitter & Update Status on Twitter through Arduino.

Component Required:

I) Arduino UNO Board
II) Ethernet Shield
III) USB Cable
IV) Ethernet Cable

Steps to Follow:

I) Sigh up for a new user account for thing speak.
https://www.thingspeak.com/user/new
II) Link your twitter account to the thing tweet App -click on Apps & then select thing tweet, click on a link tw3itter account.
III) Copy the API key general after linking twitter account.
IV)Mount Ethernet shield on Arduino UNO properly.
V) Connect LAN cable with Ethernet shield & Laptop/Router.
VI) Connect USB cable with Arduino & Laptop.
VII) Open the sketch of things tweet.

VIII) Enter MAC address, Ethernet shield IP Address, Default gateway IP etc. in program.
IX) Enter the thing-tweet API key the program under: String thing tweet API key= “02JS 40WLY27Q5V55”; Enter API here.
X) Upload The program in Arduino.
XI) Click your twitter Account.

Exercise 8: Send Voltage or Analog Data on Cloud Server.

Component Required:

I) Arduino UNO Board
II) Ethernet Shield
III) 10k Ohm Preset
IV) USB Cable
V) Ethernet cable
VI) Jumper Wire M-M

Steps to Follow:

I) Mount Ethernet shield on Arduino UNO properly.
II) Connect LAN cable with Ethernet shield & Laptop/Router.
III) Connect bottom two pins of 10k preset on I10 & I12 on breadboard & center Top pin on G11.
IV) Connect a jumper wire from 5V of Arduino to J10 of breadboard.
V) Connect jumper wire from GND of Arduino to J12 of breadboard.
VI) Connect jumper wire form F11 of breadboard of A0 on Arduino
VII) Login to your thing speak Account & click on channel. Then click on Create new channel.
VIII) Give a channel name, select field, and write volt in field1 text then save.
IX) Now write AOPI form API tab.
X) Open the sketch for voltage upload and enter the API key & MAC address in program.
XI) Upload the program to Arduino & then check your things speak channel.

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Exercise 9: Use Arduino to upload free data form Environmental sensors to cloud server

Components Required:

I) Arduino UNO Board
II) Ethernet Shield
III) DHT11
IV) 4.7K Resistor
V) USB Cable
VI) Ethernet Cable
VII) Jumper Wire M-M

Steps to Follow:

I) Mount Ethernet shield on Arduino UNO Properly.
II) Connect LAN cable with Ethernet shield & Laptop/Router.
III) Repeat Steps 1 to 3 & step 5 from “Reading Environment Value” project.
IV) Connect a jumper wire between A11of breadboard to Pin 5 on Arduino Ethernet shield.
V) Import DHT11 Lib in Arduino EDE software.
VI) Login to your Thing speak Account & Click on Channel Then click on Create New Channel.
VII) Give Channel name weather station, select field1 and write temperature in field1 Text field. Select field2 & write humidity in Field2 Text Field. Save.
VIII) Note the Write API form API tab.
IX) Connect USB cable form Arduino to Laptop.
X) Open the sketch for upload sensor Date & enter the API key & MAC address in program.
XI) Upload the program to Arduino & Then check your Things. Speak channel.