Internet of Things (IoT)

"The Internet of Things (Iot) Brings Together Devices, Sensors, Cloud, Data and your Imagination. Build What Matters Most to You."

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Abstract: **The following paper contains a brief introduction on IoT, its scope, Trends, Architecture Devices used to develop applications and Successful examples**.

Keywords – IoT, scope of IoT, Trends of IoT

I. INTRODCTION TO INTERNET OF THINGS

Following on from the Internet of computers, when our servers and personal computers were connected to a global network, and the Internet of mobile telephones, when it was the turn of telephones and other mobile units, the next phase of development is the Internet of things, when more or less anything will be connected and managed in the virtual world. This revolution will be the Net's largest enlargement ever and will have sweeping effects on every industry — and all of our everyday lives.

Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. With the growing presence of WiFi and 4G-LTE wireless Internet access, the evolution towards ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment.

The Internet revolution led to the interconnection between people at an unprecedented scale and pace. The next revolution will be the interconnection between objects to create a smart environment

II. DEFITNITION OF INTERNET OF THINGS

"Things are active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment by exchanging data and information sensed about the environment, while reacting autonomously to the real/physical world events and influencing it by running processes that trigger actions and create services with or without direct human intervention."

—Cluster of European research projects on the Internet of Things.

III. 24 HOURS IN FUTURE WITH INTERNET OF THINGS

How many devices do you currently own? Three, four or more? A laptop, a tablet, a smartphone or even a smart watch and a smart band or the new Nike smart shoes maybe? It goes without saying that technology has become an indispensable part of our lives.

Here is how 24 hours would like in the future with IoT-

I wouldn't need to set an alarm for the next day. My smartphone will pick up the time of my meeting from my digital calendar will connect to estimate the real time traffic and predict my travelling time to the meeting venue will analyze how much time I usually take to get ready AND finally it will calculate how early I need to wake up!

My smart heater would know that I am up and it will adjust the water temperature according to my preference.

When I'll be ready to leave the house, the smart refrigerator will tell me that there is milk and fruits for my breakfast and I shouldn't eat cheese today because I didn't exercise yesterday. It is so smart that if any food item has finished or expired- it will connect to the supermarket on the internet, order my groceries and I would be able to pay sitting from anywhere anytime through my mobile wallet.

When I am finished eating breakfast, my smart car will turn the AC on so that as soon as I start driving there is a favorable temperature in the car and smart radio will be automatically turned to my favorite radio station.

When let's say I get back from a yoga class, my smart clothing will know that I am sweating and this data will be sent to my smart home temperature system which will adjust the room temperature as soon as I enter the house to make me feel comfortable.

These devices are so smart that they would be collecting data from my physical movements and will monitor my activities and behavior to do predictive analysis of my routine and preferences.

You would be amazed at how many such smart devices already exist or are going to be available in the near future to make up a powerful Internet of Things.

Special Issue - 2015

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NSRCL-2015 Conference Proceedings

IV. TRENDS

IDC estimates Internet of Things (IoT) market to grow to $8.9 trillion with over 212 billion connected things by 2020. The no. of connected devices surpassed total world population in year 2005 and it is estimated that no. of devices will be around 50 billion which is about 7 times of the world population at that time.

V. ARCHITECTURE OF INTERNET OF THINGS

Architecture of internet Of Things contains basically 4 layers:

1. Application Layer
2. Gateway and the network layer
3. Management Service layer
4. Sensor layer

A. *APPLICATION LAYER:*

- Lowest Abstraction Layer
- With sensors we are creating digital nervous system.
- Incorporated to measure physical quantities
- Interconnects the physical and digital world
- Collects and process the real time information

B. *GATEWAY AND THE NETWORK LAYER:*

- Robust and High performance network infrastructure
- Supports the communication requirements for latency, bandwidth or security
- Allows multiple organizations to share and use the same network independently

C. *MANAGEMENT LAYER:*

- Capturing of periodic sensory data
- Data Analytics (Extracts relevant information from massive amount of raw data)
- Streaming Analytics (Process real time data)
- Ensures security and privacy of data.

D. SENSOR LAYER:

- Provides a user interface for using IoT.
- Different applications for various sectors like Transportation, Healthcare, Agriculture, Supply chains, Government, Retail etc.

VI. DEVELOP WINDOWS IOT APPS.

A. *Step 1 : Select your device*
- Raspberry Pi 2

The Raspberry Pi 2 is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. The Raspberry Pi 2 runs Windows 10 IoTCore[1].

- MinnowBoard Max

MinnowBoard MAX is an open hardware embedded board with the Intel Atom E38XX series SOC at its core. MinnowBoard MAX supports Windows 10 IoT Core Insider Preview.

- Galileo

Intel Galileo is the first in a line of Arduino-certified development boards based on Intel x86 architecture and is designed for the maker and education communities. Galileo supports only the previous versions of Windows, not Windows 10 IoT Core.

- Windows Remote Arduino

Windows Remote Arduino is an open-source Windows Runtime Component library which allows Makers to control an Arduino through a Bluetooth or USB connection. It is intended for Windows Runtime developers who want to harness the power of Arduino hardware using the Windows Runtime languages. Developers who include this component in their projects will automatically have access to its features in any of the WinRT languages (C++/CX, C# and JavaScript).

- Windows Virtual Shields for Arduino

Windows Virtual Shields for Arduino is an open-source library primarily for the Arduino UNO which communicates with an open-source Universal Windows application running on all Windows 10 devices, including Windows Lumia phones. The library exposes Lumia phones' sensors and capabilities to the an Arduino Wiring Sketch.

B. *Step 2: Setup your pc*

Install Visual Studio 2015 and Windows 10 IOT core tools

C. *Step 3: Setup your device*
I.   What you need ?

i.   A PC running Windows 10 Insider Preview (Prepared in the previous step)
ii. Raspberry Pi 2
iii. 5V micro USB power supply - with at least 1.0A current8GB micro SD card - class 10 or better. (We suggest this one or this one)
iv. HDMI cable and monitor

Special Issue - 2015

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
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> v.   Ethernet cable
> vi.   Micro SD card reader

II.   Put the windows 10 ioT Core Insider Preview image on your SD card.
III.   Hook up your board.
>   i.   Insert the micro CD card.
>   ii.   Connect a network cable.
>   iii. Connect the HDMI monitor
>   iv.   Connect the power supply
>   v.   Connect external devices if any.

IV.   BOOT WINDOWS 10 IOT CORE INSIDER PREVIEW.

i.   Windows 10 IoT Core Insider Preview will boot automatically after connecting power the supply. This will take a few minutes.
ii.   Once the device has booted, the DefaultApp will launch and display the IP address of RPi2.
D.   Step 4: Develop.
>   I.   Develop the application in Visual Studio.
>   II.   Create a remote connection with the device using the IP address of the device.

VII.   APPLICATIONS:

There are several application domains which will be impacted by the emerging Internet of Things. The applications can be classified based on the type of network availability, coverage, scale, heterogeneity, repeatability, user involvement and impact[3].

We categorize the applications into four application domains:
(1)   Personal and Home:Automated home, Home monitoring systems, health care system, fitness and health tracking etc.
(2)   Enterprize: Connected Retail, Environmental monitoring, security, automation, climate control, etc.
(3)   Utilities :Smart watches, Virtual augmented Reality Surveillance, Water network monitoring etc
(4)   Mobile. : GPS based mapping technologies etc.

VIII.   BENEFITS OF INTERNET OF THINGS

- Improved citizen's quality of life
    Healthcare from anywhere
    Better safety, security and productivity
- New business opportunities
    IoT can be used in every vertical for improving the efficiency
    Creates new businesses, and new and better jobs
- Economical growth
    Billions of dollars in savings and new services
- Better environment
    Saves natural resources and trees
    Helps in creating a smart, greener and sustainable planet
- Improved competitiveness
    Competitive in providing cutting edge products/services

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