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Internal Assessment Test 1 – Nov. 2021

Sub:	**Mobile Applications**							**Sub Code:**	**20MCA32**
Date:	**11/11//2021**	**Duration:**	**90 min's**	**Max Marks:**	**50**	**Sem:**	**III**	**Branch:**	**MCA**

Note : Answer FIVE FULL Questions, choosing ONE full question from each Module

		MARKS	OBE	
			CO	RBT
	PART I			
1	Define IOT. Explain the different evolutionary phases of internet.	[10]	CO1	L1
	OR			
2	Describe IOT world forum Standardized architecture.	[10]	CO1	L2
	PART II			
3	Compare and contrast IOT & OT.	[10]	CO1	L2
	OR			
4	Explain the core IOT functional Stack.	[10]	CO1	L1

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	PART III			
5	Explain the different parts of Arduino Uno board with the neat diagram	[10]	CO5	L2
	OR			
6	Write a program to record the current room temperature using Raspberry Pi.	[10]	CO5	L2
	PART IV			
7	With a neat diagram, Explain Raspberry Pi learning board	[10]	CO5	L2
	OR			
8	Explain the following with respect to arduino programming language i. Structure ii. Functions iii. Data types iv. Flow control statements v. variables	[10]	CO5	L2
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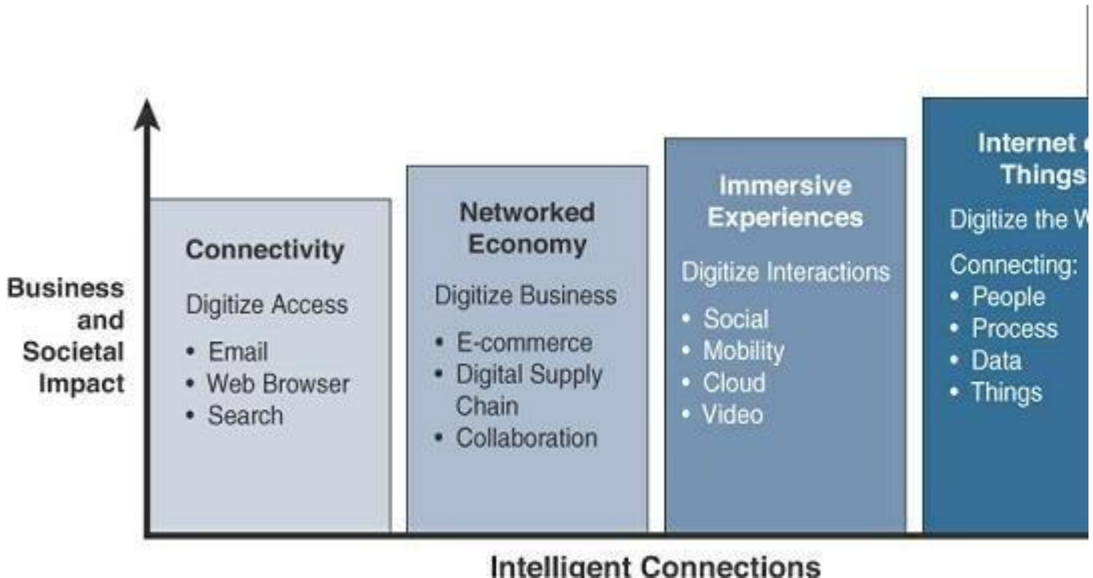
Internal Assessment Test 1– Nov 2021

Sub:	Internet of Things					Sub Code:	**20MCA32**	Branch:	MCA	
Date:	11/11/2021	Duration:	90 min's	Max Marks:	50	Sem	III			OBE

Q1. Define IOT. Explain the different evolutionary phases of internet

IoT is a technology transition in which devices will allow us to sense and control the physical world by making objects smarter and connecting them through an intelligent network.

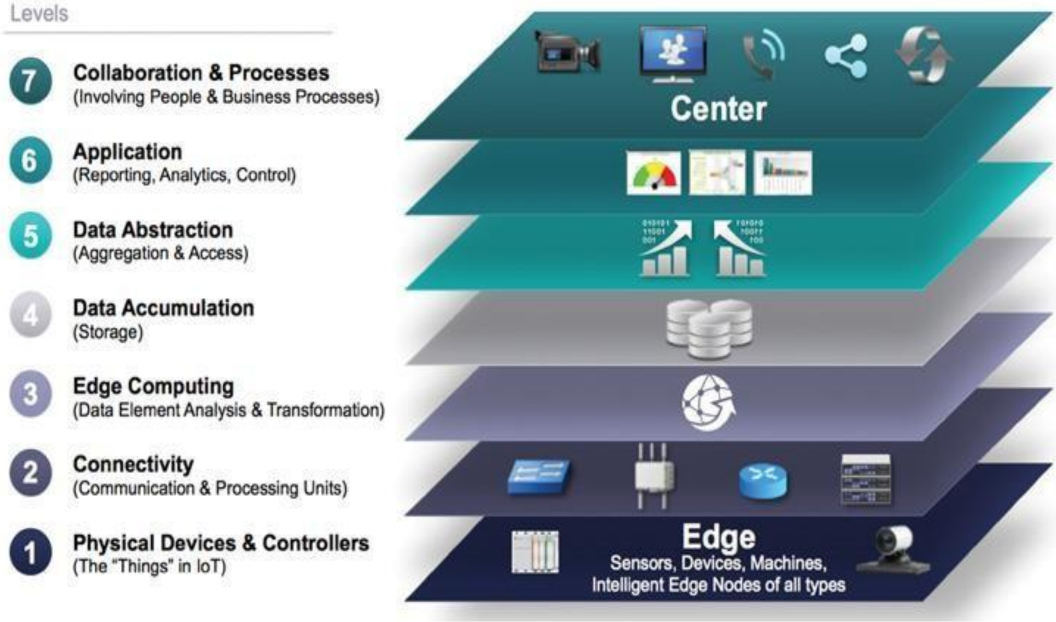
The different evolutionary phases of internet



Q2. Describe IOT world forum Standardized architecture.

This publish a seven-layer IoT architectural reference model.

- While various IoT reference models exist, the one put forth by the IoT World Forum offers a clean, simplified perspective on IoT and includes edge computing, data storage, and access. It provides a succinct way of visualizing IoT from a technical perspective. Each of the seven layers is broken down into specific functions, and security encompasses the entire model.



Using this reference model, we are able to achieve the following:

1. Decompose the IoT problem into smaller parts
2. Identify different technologies at each layer and how they relate to one another
3. Define a system in which different parts can be provided by different vendors
4. Have a process of defining interfaces that leads to interoperability
5. Define a tiered security model that is enforced at the transition points between levels

Layer 1: Physical Devices and Controllers Layer

The first layer of the IoT Reference Model is the physical devices and controllers layer. This layer is home to the "things" in the Internet of Things, including the various endpoint devices and sensors that send and receive information. The size of these "things" can range from almost microscopic sensors to giant machines in a factory. Their primary function is generating data and being capable of being queried and/or controlled over a network.

Layer 2: Connectivity Layer

In the second layer of the IoT Reference Model, the focus is on connectivity. The most important function of this IoT layer is the reliable and timely transmission of data. More specifically, this includes transmissions between Layer 1 devices and the network and between the network and information processing that occurs at Layer 3 (the edge computing layer).

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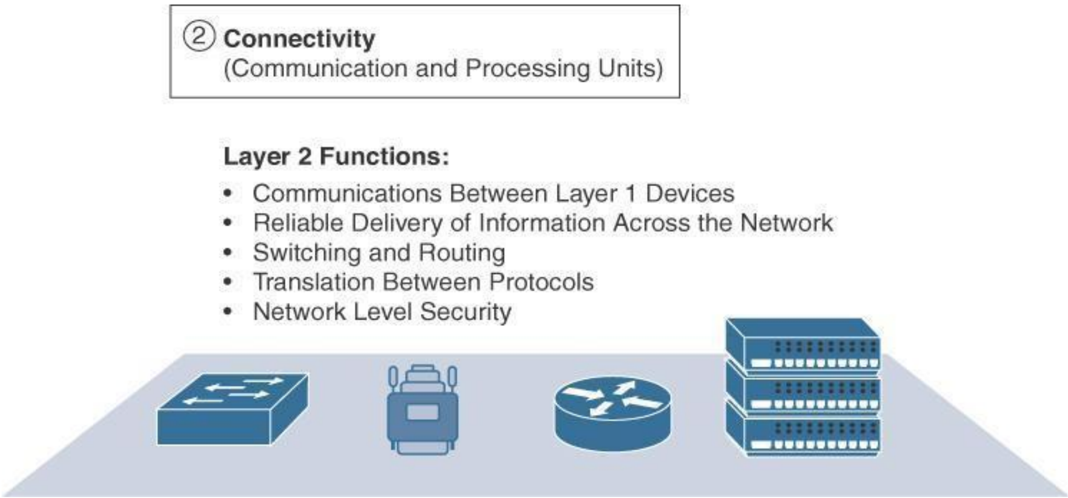
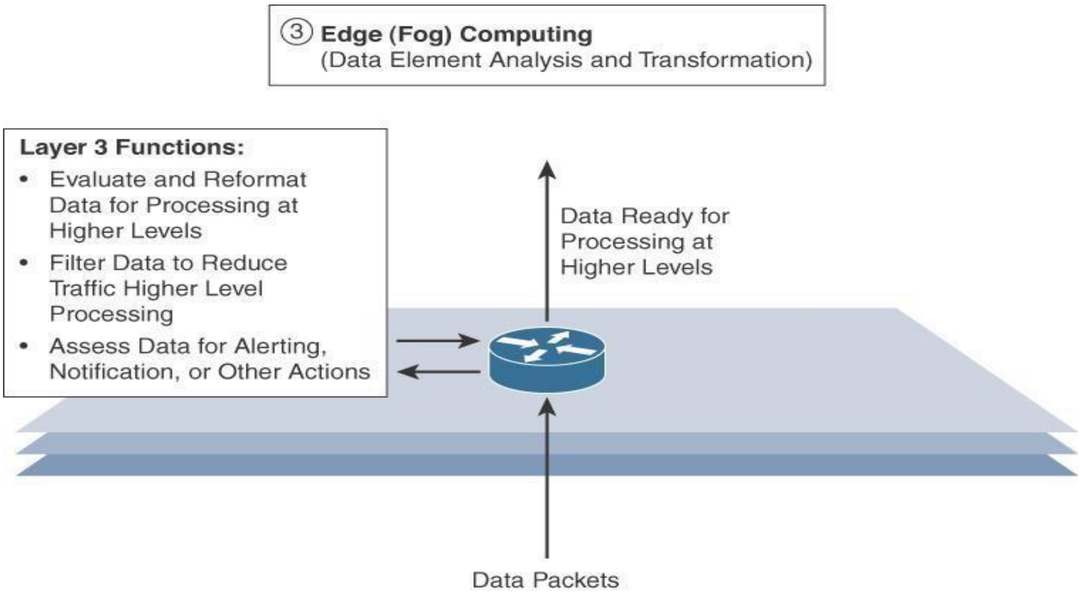


IoT Reference Model Connectivity Layer Functions

Layer 3: Edge Computing Layer

Edge computing is the role of Layer 3. Edge computing is often referred to as the "fog" layer and is discussed in the section "Fog Computing," later in this chapter. At this layer, the emphasis is on data reduction and converting network data flows into information that is ready for storage and processing by higher layers. One of the basic principles of this reference model is that information processing is initiated as early and as close to the edge of the network as possible



IoT Reference Model Layer 3 Functions

Another important function that occurs at Layer 3 is the evaluation of data to see if it can be filtered or aggregated before being sent to a higher layer. This also allows for data to be reformatted or decoded, making additional processing by other systems easier. Thus, a critical function is assessing the data to see if predefined thresholds are crossed and any action or alerts need to be sent.

Upper Layers: Layers 4–7

The upper layers deal with handling and processing the IoT data generated by the bottom layer. For the sake of completeness, Layers 4–7 of the IoT Reference Model are summarized in Table .

Q3. Compare and contrast IOT & OT.

Q4. Explain the core IOT functional Stack.

Layer 1: Things: Sensors and Actuators Layer

"Smart Objects: The 'Things' in IoT," provides more in-depth information about smart objects. From an architectural standpoint, the variety of smart object types, shapes, and needs drive the variety of IoT protocols and architectures. One architectural classification could be:

- **Battery-powered or power-connected:** This classification is based on whether the object carries its own energy supply or receives continuous power from an external power source.
- **Mobile or static:** This classification is based on whether the "thing" should move or always stay at the same location. A sensor may be mobile because it is moved from one object to another or because it is attached to a movin
- **Low or high reporting frequency:** This classification is based on how often the object should report monitored parameters. A rust sensor may report values once a month. A motion sensor may report acceleration several hundred times per second.
- **Simple or rich data:** This classification is based on the quantity of data exchanged at each report cycle
- **Report range:** This classification is based on the distance at which the gateway is located. For example, for your fitness band to communicate with your phone, it needs to be located a few meters away at most.
- **Object density per cell:** This classification is based on the number of smart objects (with a similar need to communicate) over a given area, connected to the same gateway.

. Layer 2: Communications Network Layer

Once you have determined the influence of the smart object form factor over its transmission capabilities (transmission range, data volume and frequency, sensor density and mobility), you are ready to connect the object and communicate.

Compute and network assets used in IoT can be very different from those in IT environments. The difference in the physical form factors between devices used by IT and OT is obvious even to the most casual of observers. What typically drives this is the physical environment in which the devices are deployed. What may not be as inherently obvious, however, is their operational differences. The operational differences must be understood in order to apply the correct handling to secure the target assets.

Access Network Sublayer

There is a direct relationship between the IoT network technology you choose and the type of connectivity topology this technology allows. Each technology was designed with a certain number of use cases in mind (what to connect, where to connect, how much data to transport at what interval and over what distance). These use cases determined the frequency band that was expected to be most suitable, the frame structure matching the expected data pattern (packet size and communication intervals), and the possible topologies that these use cases illustrate.

One key parameter determining the choice of access technology is the range between the smart object and the information collector. Figure 2-9 lists some access technologies you may encounter in the IoT world and the expected transmission distances.

- ✔ Range estimates are grouped by category names that illustrate the environment or the vertical where data collection over that range is expected. Common groups are as follows:

- **PAN (personal area network):** Scale of a few meters. This is the personal space around a person. A common wireless technology for this scale is Bluetooth.
- **HAN (home area network):** Scale of a few tens of meters. At this scale, common wireless technologies for IoT include ZigBee and Bluetooth Low Energy (BLE).
- **NAN (neighborhood area network):** Scale of a few hundreds of meters. The term NAN is often used to refer to a group of house units from which data is collected.
- **FAN (field area network):** Scale of several tens of meters to several hundred meters. FAN typically refers to an outdoor area larger than a single group of house units. The FAN is often seen as “open space” (and therefore not secured and not controlled).
- **LAN (local area network):** Scale of up to 100 m. This term is very common in networking, and it is therefore also commonly used in the IoT space when standard networking technologies (such as Ethernet or IEEE 802.11) are used.

Layer 3: Applications and Analytics Layer

Once connected to a network, your smart objects exchange information with other systems. As soon as your IoT network spans more than a few sensors, the power of the Internet of Things appears in the applications that make use of the information exchanged with the smart objects.

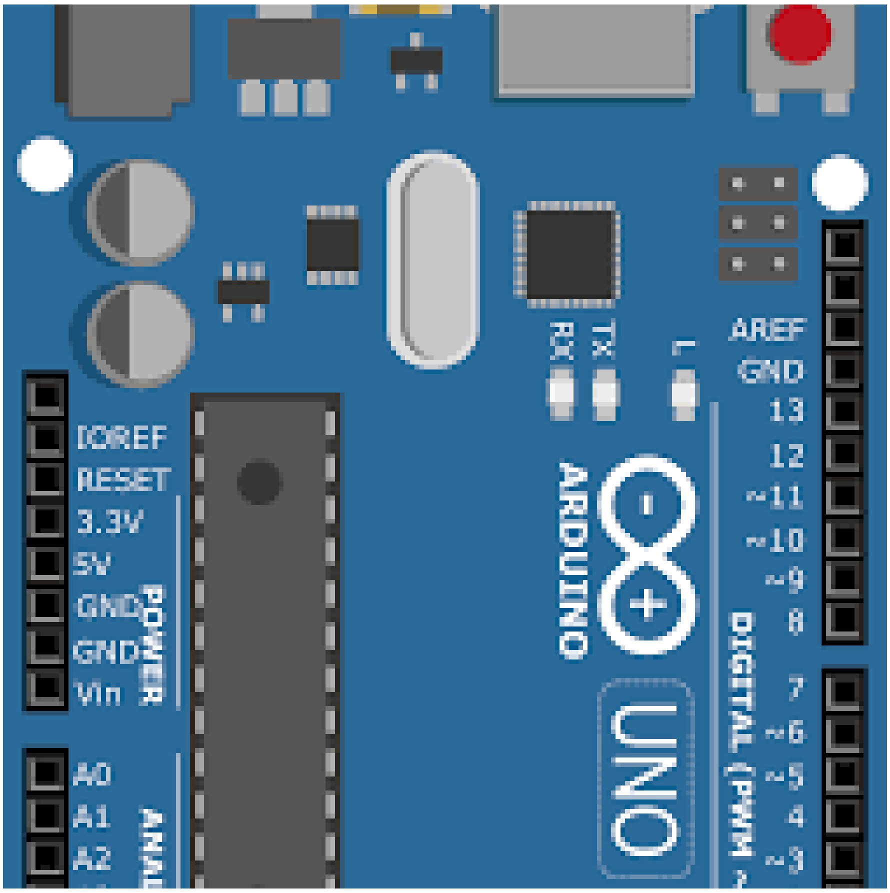
Analytics Versus Control Applications

Multiple applications can help increase the efficiency of an IoT network. Each application collects data and provides a range of functions based on analyzing the collected data. It can be difficult to compare the features offered. From an architectural standpoint, one basic classification can be as follows:

Analytics application: This type of application collects data from multiple smart objects, processes the collected data, and displays information resulting from the data that was processed. The display can be about any aspect of the IoT network, from historical reports, statistics, or trends to individual system states. The important aspect is that the application processes the data to convey a view of the network that cannot be obtained from solely looking at the information displayed by a single smart object.

- **Control application:** This type of application controls the behavior of the smart object or the behavior of an object related to the smart object. For example, a pressure sensor may be connected to a pump. A control application increases the pump speed when the connected sensor detects a drop in pressure. Control applications are very useful for controlling complex aspects of an IoT network with a logic that cannot be programmed inside a single IoT object, either because the configured changes are too complex to fit into the local system or because the configured changes rely on parameters that include elements outside the IoT object.

Q5) Explain the different parts of Arduino Uno board with the neat diagram

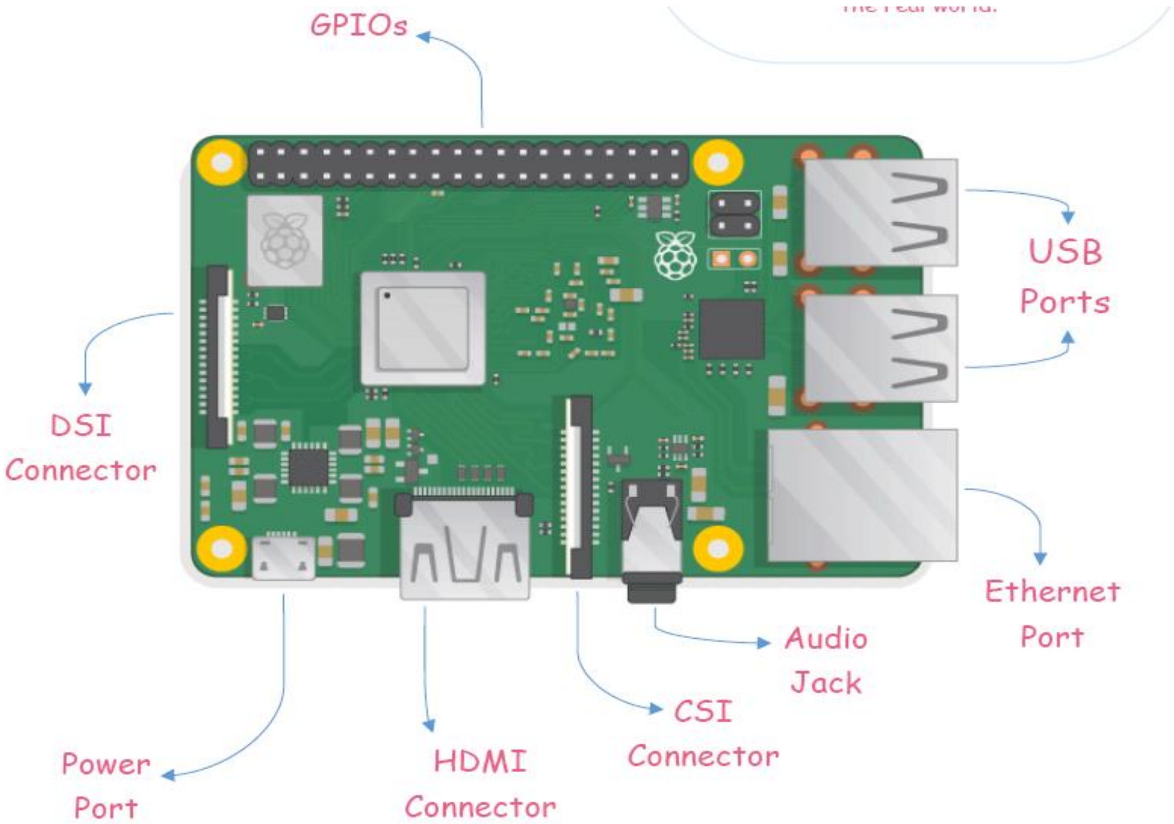


Q6) Explain IOT challenges

Challenge	Description
Scale	While the scale of IT networks can be large, the scale of OT can be several orders of magnitude larger. For example, one large electrical utility in Asia recently began deploying IPv6-based smart meters on its electrical grid. While this utility company has tens of thousands of employees (which can be considered IP nodes in the network), the number of meters in the service area is tens of millions. This means the scale of the network the utility is managing has increased by more than 1,000-fold! Chapter 5, "IP as the IoT Network Layer," explores how new design approaches are being developed to scale IPv6 networks into the millions of devices.
Security	With more "things" becoming connected with other "things" and people, security is an increasingly complex issue for IoT. Your threat surface is now greatly expanded, and if a device gets hacked, its connectivity is a major concern. A compromised device can serve as a launching point to attack other devices and systems. IoT security is also pervasive across just about every facet of IoT. For more information on IoT security, see Chapter 8, "Securing IoT."

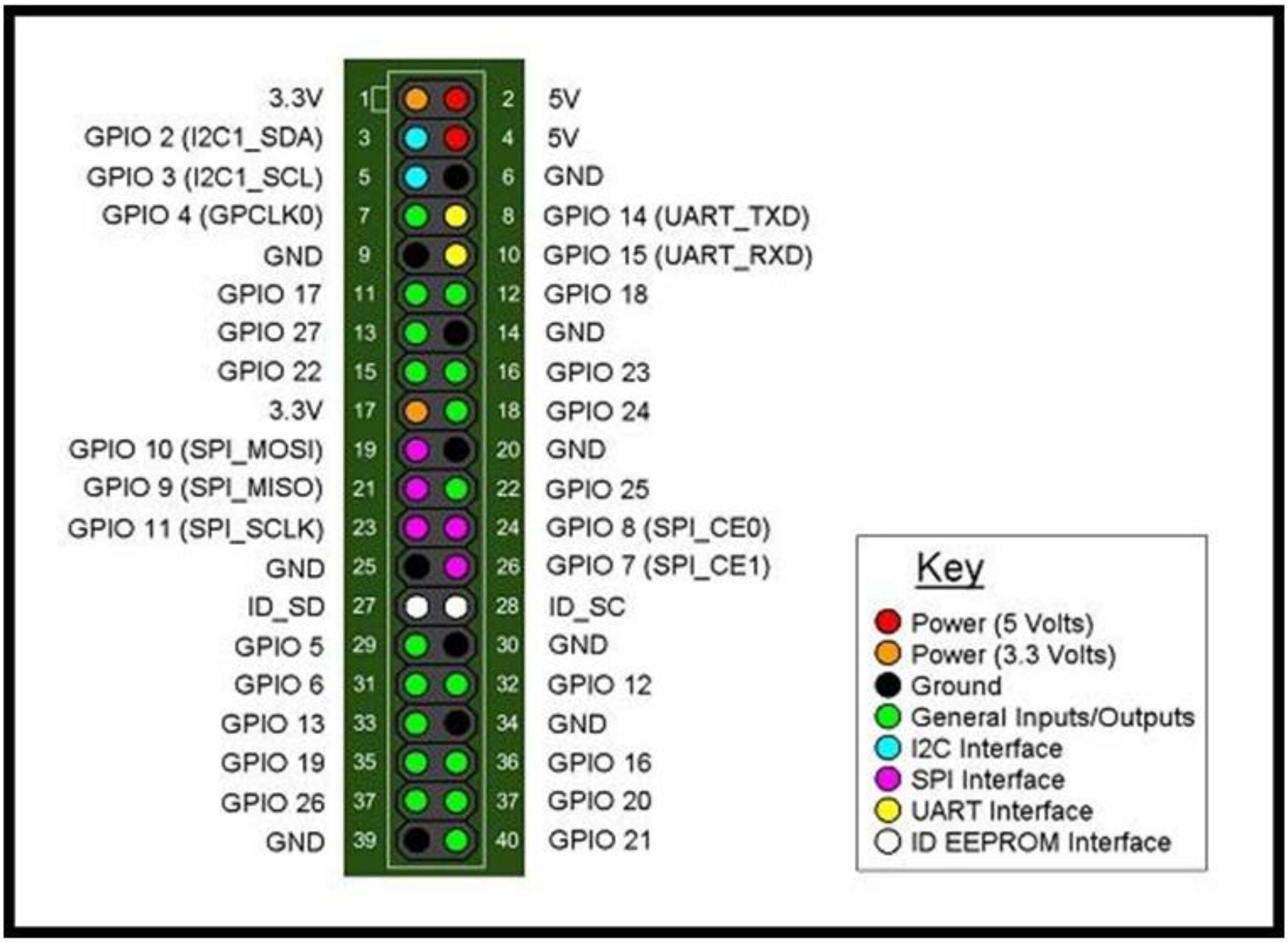
Privacy	As sensors become more prolific in our everyday lives, much of the data they gather will be specific to individuals and their activities. This data can range from health information to shopping patterns and transactions at a retail establishment. For businesses, this data has monetary value. Organizations are now discussing who owns this data and how individuals can control whether it is shared and with whom.
Big data and data analytics	IoT and its large number of sensors is going to trigger a deluge of data that must be handled. This data will provide critical information and insights if it can be processed in an efficient manner. The challenge, however, is evaluating massive amounts of data arriving from different sources in various forms and doing so in a timely manner. See Chapter 7 for more information on IoT and the challenges it faces from a big data perspective.
Interoperability	As with any other nascent technology, various protocols and architectures are jockeying for market share and standardization within IoT. Some of these protocols and architectures are based on proprietary elements, and others are open. Recent IoT standards are helping minimize this problem, but there are often various protocols and implementations available for IoT networks. The prominent protocols and architectures—especially open, standards-based implementations—are the subject of this book. For more information on IoT architectures, see Chapter 2, "IoT Network Architecture and Design." Chapter 4, "Connecting Smart Objects," Chapter 5, "IP as the IoT Network Layer," and Chapter 6, "Application Protocols for IoT," take a more in-depth look at the protocols that make up IoT.

Q7) With a neat diagram, Explain Raspberry Pi learning board Steps



- GPIOs- Connect devices to interact with the real world, for instance, sensors, LEDs, Motors etc.
- USB Port- to connect a mouse, a keyboard or other peripherals.
- Ethernet Port- to connect to the internet using an Ethernet cable.
- Audio Jack- to connect an audio device.
- CSI Connector- to connect a camera with a CSI(Camera Serial Interface) ribbon.
- HDMI Connector- to connect a monitor or TV.

- Power Port- to power up your Pi.
- DSI Connector- to connect DSI compatible Display.



Q8) Explain the following with respect to arduino programming language

i.Structure

Sketch

- A sketch is a program written with the Arduino IDE.[57] Sketches are saved on the development computer as text files with the file extension .ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde.
- A minimal Arduino C/C++ program consist of only two functions:
  - setup(): This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.
  - loop(): After setup() function exits (ends), the loop() function is executed repeatedly in the main program. It controls the board until the board is powered off or is reset.

ii.Functions

Digital I/O

a. pinMode()
b. digitalRead()
c. digitalWrite()

Analog I/O

- analogRead()
- analogWrite()

iii.Data types

iv.Flow control statements

if and if ..else Statement

```
if (expression)
{
statement;
}
if (expression)
{
do_this;
}
else
{
do_that;
}
```

v.Variables

A variable is a name of the memory location. It is used to store data. Its value can be changed, and it can be reused many times.

It is a way to represent memory location through symbol so that it can be easily identified.

Let's see the syntax to declare a variable:

1. type variable_list;

The example of declaring the variable is given below:

1. int a;
2. float b;
3. char c;

Q9) Explain with the neat diagram of one M2M IOT standardized architecture.

In an effort to standardize the rapidly growing field of machine-to-machine (M2M) communications, the European Telecommunications Standards Institute (ETSI) created the

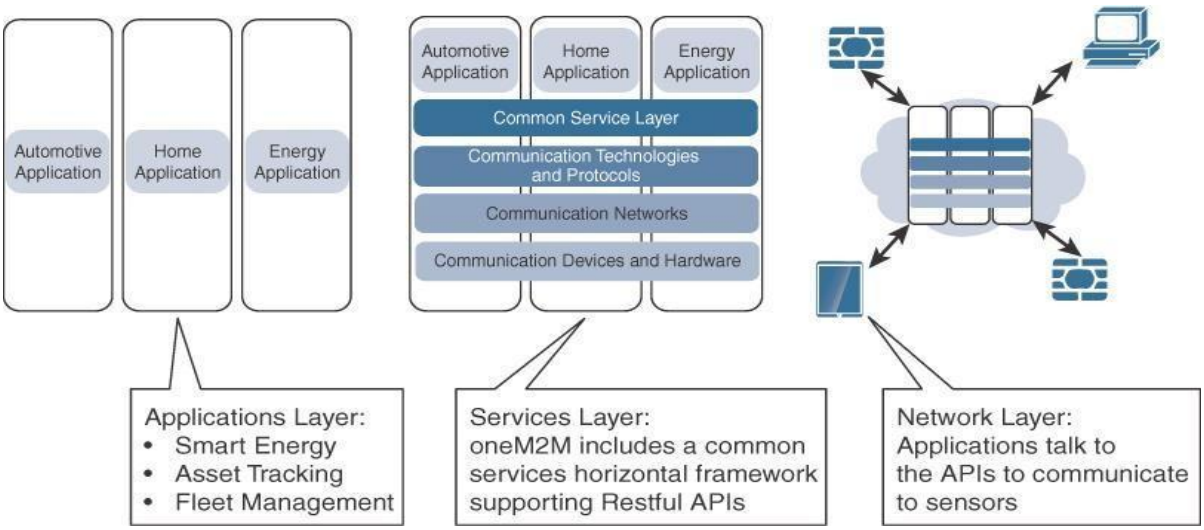
M2M Technical Committee in 2008. The goal of this committee was to create a common architecture that would help accelerate the adoption of M2M applications and devices. Over time, the scope has expanded to include the Internet of Things.

One of the greatest challenges in designing an IoT architecture is dealing with the heterogeneity of devices, software, and access methods. By developing a horizontal platform architecture, oneM2M is developing standards that allow interoperability at all levels of the IoT stack

- **Applications layer:** The oneM2M architecture gives major attention to connectivity between devices and their applications. This domain includes the application-layer protocols and attempts to standardize northbound API definitions for interaction with business intelligence (BI) systems. Applications tend to be industry-specific and have their own sets of data models, and thus they are shown as vertical entities.

- **Services layer:** This layer is shown as a horizontal framework across the vertical industry applications. At this layer, horizontal modules include the physical network that the IoT applications run on, the underlying management protocols, and the hardware. Examples include backhaul communications via cellular, MPLS networks, VPNs, and so on. Riding on top is the common services layer.

- **Network layer:** This is the communication domain for the IoT devices and endpoints. It includes the devices themselves and the communications network that links them. Embodiments of this communications infrastructure include wireless mesh technologies, such as IEEE 802.15.4, and wireless point-to-multipoint systems, such as IEEE 801.11ah.



Q10) Write a note on IOT impact on real world.

- **Connected roadways**
  Most connected roadways solutions focus on resolving today's transportation challenges. These challenges are:
  - Safety
  - Mobility
  - Environment

  These challenges (in connected roadways) will bring many benefits to society. These benefits include reduced traffic jams and urban congestion, decreased casualties and fatalities, increased response time for emergency vehicles, and reduced vehicle emissions.

- **Connected Factory**

The main challenges facing manufacturing in a factory environment today include the following:

- ◦ Accelerating new product and service introductions to meet customer and market opportunities
- ◦ Increasing plant production, quality, and uptime while decreasing cost
- ◦ Mitigating unplanned downtime (which wastes, on average, at least 5% of production)
- ◦ Securing factories from cyber threats
- ◦ Decreasing high cabling and re-cabling costs (up to 60%

of deployment costs)

- ◦ Improving worker productivity and safety

- **Smart connected building**

Buildings have become increasingly complex intersections of structural, mechanical, electrical, and IT components.

The function of a building

- ◦ is to provide a work environment that keeps the workers comfortable, efficient, and safe.
- ◦ Work areas need to be well lit and kept at a comfortable temperature.
- ◦ To keep workers safe, the fire alarm and suppression system needs to be carefully managed, as do the door and physical security alarm systems.

Many buildings are beginning to deploy sensors throughout the building to detect occupancy.

- ◦ These tend to be motion sensors or sensors tied to video cameras.
- ◦ Motion detection occupancy sensors work great if everyone is moving around in a crowded room and can automatically shut the lights off when everyone has left**.**

- **Smart creatures**

Explanation on smart cockroach as a life savior.