

Assignment - 1

Unit - 1

Q) Define IoT and what are the things in IoT?

a) IoT refers to the interconnection via the Internet of computing devices embedded in everyday objects enabling them to send and receive data.

Things in IoT:

- * Things refer to Variety of devices. Not really just one device become things.
- * At times, you and I are things! (Think, how)
- * Anything to qualify as a "THING" requires identify (I told you this)
- * The "THING" can monitor measure etc means, a temperature sensor could be a thing.
- * Things are capable of exchanging the data with other connected devices in the Infra.

* The data could be stored in a centralised server, processed there and a control action could be initialized.

The devices involved in getting this accomplished are things:

② Discuss the characteristics and challenges of IoT?

A) Security / Personnel safety:

- * very high rated / most important challenge
- * More number of devices are used in the IoT Infra and this is a challenge
- * user data could be vulnerable for theft.
- * peoples Personal safety is a concern as "PII" is a challenge (too much information)
- * Poor security features can let the attack damage the whole network.

Privacy:

- * You could be tracked / monitored by anyone as you are connected 24x7 in the Internet

- + you could be tracked without your permission is placed. It is a threat to you.
- * so, there is a threat. How do we deal with it? It is a challenge for sure?

Data extraction from complex environments:-

- * How to sense information from the complex environment?
- * for an instance, how to sense the data during transport vehicle? Assume, a very temperature sensitive material is being transported?

Connectivity :-

- * Requirement of wired and wireless connectivity.
- * usage frequency / spectrum is also to be remembered.

Power Requirements :-

- * All the IoT devices need power. Most of them are battery operated.

- * Thanks to long lasting batteries.
- * However, demand for power is ever on the rise, and usage of green Power sources like solar / wind is to be motivated.

Complexity involved:-

- * IoT is not easier.
- * Needs IoT of different domains to come together.
- * limited expertise in the market.
- * The tool kits, software, hardware not abundant.

Storage :-

- * Cloud is becoming basis of transport. Problem is,
- * which could be used?
- * How to identify?
- * How much does it cost?
- * Do we really need cloud?

Characteristics of IoT :-

1) Connectivity :-

Things in IoT should be connected to the infrastructure and connectivity is important.

Character/ requirement for an infra of IoT.

Anyone, anywhere, anytime. Connectivity should be guaranteed in the IoT Infra without connection, nothing make sense.

2) Intelligence & Identity :-

The extraction of knowledge from the generated data is very important. Sensors generate data, the data is to be interrupted properly. Each IoT device has a unique identity. This identity is helpful in tracking the equipment and at times to query the status.

3) Scalability :-

The number of things getting connected to IoT infra is getting increased.

day by day. Hence, an IoT setup shall be capable to handle the massive expansion. Also the data generated shall be massive and it should be handled appropriately.

4) Dynamic and self adapting :-

The IoT devices should be dynamically adapt. Ptsely to the changing contexts. Assume a camera for surveillance. It may have to work in different conditions as different light situations.

5) Architecture :-

Architecture cannot be homogeneous in nature. It should be hybrid, supporting different manufacturers. Product to be IoT network.

6) Safety :-

Having got all the things connected to Internet, the personal data is under

threat. Hence, securing the data is a major challenge. Not only data security the equipment getting involved, in IoT network is huge. Hence, the Personal safety is also be considered PRIVACY with PROTECTION.

③ Explain the IoT stack with all the levels.

④ IoT technology stack is nothing else than a range of technologies standards and tools which lead from the simple connection of objects to the applications that use these connected things, the data they gather and communicate and the different steps needed to power them.

Level - I

- * Level one have sensor/ devices to sense.
- * The data to be stored is locality.
- * Data Analysis to be done
- * Monitoring / Control.
- * Data is not huge. Means not a

big data here ! All the control happens through Internet.

Level - II

- * Here, the data is definitely Voluminous.
- * Means, the frequency of the sensing done by sensor is faster.
- * Here, Cloud storage is preferred as data is huge.
- * Analysis done locally. Cloud meant for storage alone.
- * Based on the date analysis, the storage control action can be triggered through the web app (or) mobile application.

Level - 3 :-

- * Here the data is definitely Voluminous.
- * Means, the frequency of the sensing done by sensor is faster.
- * Here, Cloud storage is preferred as data is huge.
- * Some examples could be Agricultural

Level-4:- mid-range distributed approaches

- * Here, the data is definitely voluminous.
- * Means the frequency of the sensing done by sensor is faster. Also, multiple nodes are there and they are independent to each other.

Level-5:- no middle node approach

- * Here, the data is definitely voluminous.
- * Means, the frequency of sensing done by sensor is faster. Also, multiple nodes are there and they are independent of each other.
- * The data is collected by coordinator node and sent to the cloud.
- * Here, cloud storage is preferred as data storage.
- * Analysis done is in the cloud, application is totally cloud based.
- * REAL TIME
- * Based on data analysis, the control action can be triggered through

web app (or) mobile application.

④ Discuss 5 levels in IoT.

1) 1) Data generation and Ingestion:

organisation begins projects to generate and collect IoT data. This involves coupling their services or products with devices that capture data via gateways to transmit that data. Implementing data ingestion pipelines to absorb that data and storing that data for later uses.

2) First Analysis:-

what is it about once armed with data companies will typically try to derive some value out of it. These are initially ad-hoc exploratory efforts. Some companies about how they will use the data, while others will need to embark in exploring data to find useful surprises.

for example data Analysis of scientists will start connecting to data with mainstream tools like excel, and power PI start exploring.

3) Deep learning:-
what is it about the organization recognises that the data is much more valuable any larger than manual analysis permits and starts investing in the technology that can automatically extracts the insights from the data. These are typically investments in the deep learning or machine learning (or) streaming analysis. where as the value of the data is level, was extracted from the manual work by of data in level 3 is extracted automatically, from sophisticated algorithms & modeling.

Level-4:-

Autonomous Decision Making
The deep learning any and analytical

models along with the accuracy & reliability are solid upon existing dev.

3. The organisation is now in a position, to trust these models to make automated decision In level-3 the insights derived from deep learning are mostly input for pattern analysis is reporting dashboards and management decision maker in level-3 is the output of deep learning is used to trigger autonomous operations action.

5) what is the role of cloud in IoT?

④ The next technology that is highly important for IoT is cloud computing Data storage plays a major role in IoT. As a data storage option cloud has grown much more popular than expected because it serves as an affordable, effective and efficient medium for data storage All the case studies when we have cited is last as it is very

much affordable and easier to handle
and various cloud services are categorised
as follows:-

1) Platform as Service :- (PaaS)

The Cloud Contains everything you need
to build and deliver Cloud applications
so there is no need to maintain &
buy equipment, software etc.

2) Software as Services :- (SaaS)

In this case, application runs in the
cloud and other companies operate devices
that connect to user's computer through
a web browser.

3) Infrastructure as Services (IaaS) :-

IaaS is an option providing companies
with storage, servers, network & hubs
processing data for each other.

4) Hybrid cloud :-

Based on Private cloud, but provide
access to Public cloud.

5) Private cloud:-

The same as public cloud, but only one person has access here, which can be organization, an individual company (or) a user.

6) Public cloud:-

The same as a public cloud, but only one person has access here, which can be organization or individual (Company).