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* Open IoT Architecture For IoT / Cloud Convergence:

=> Open IoT is an open-source framework that enables seamless integration of IoT, devices with cloud computing platforms.

It provides a standardized architecture for managing, processing and analyzing IoT generated data.

There are Three major layer in Open IoT Architecture.

1) Wireless Sensor Network
2) Cloud Computing
3) Applications Layer

1 Wireless Sensor Network:

This Layer also known as Data Collection Layer which is responsible for collecting data from IoT devices and Transmitting it to the cloud.

It includes : Devices and Sensors,
Communication Technologies,
Edge Computing

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Application	Surveillance, Monitoring, Health system Monitoring
Cloud Computing	visualization SaaS Analytics computation PaaS Storage IaaS
Network of Things	Wireless Sensor Network

2 Cloud Computing:

This Layer also known as Data Processing Layer which is responsible for data storage, processing, analysis and service delivery.

It Includes: Cloud Service Models

- SaaS: Provides applications over the internet.

- PaaS: Offers a development platform for building and deployment.

- IaaS: Provides virtualized hardware Resources.

3 Applications Layer:

This layer also known as User Interaction layer which provides IoT services and applications to users across various domains.

It includes comman applications:
- Smart Surveillance,
- Healthcare Monitoring,
- Environmental Monitoring,
- Industrial IoT.

=> Benefits:

A. Scalability
B Interoperability
C Cost Efficiency
D Real time Data Processing
E Security and Compliance

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* Scheduling in IoT:

=> Scheduling in IoT refers to the process of assigning tasks or user requests to available resources in an optimized manner.

Scheduling ensures that tasks are executed within specified deadline while maintaining system efficiency.

-> Importance:

A. Ensure Timely execution of tasks in real-time applications.

B. Optimize resource usage while balancing workload.

C. Reduce energy consumption

D. Handle Dynamic changes in IoT environments.

-> Challenges:

A. Heterogeneous Resources: IoT devices have different

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computational Capacities.

B. Dynamic Nature : Changing workload require adaptive scheduling.

C. Energy Constraints : Efficient scheduling reduces power consumption.

D. Reliability Issues

* Resource Management in IoT

=> Resource Management in IoT involves discovering, selecting, allocating and optimizing resource to ensure efficient operation of IoT ecosystems.

-> Steps For Resource Management:

1 Resources Discovery : Identifying available resources.

2. Resources Selection : Choosing the best resource based on requirements.

3. Resource Partitioning and Provisioning : Allocating resources efficiently.

4. Tast Execution and Monitoring : Managing workloads Dynamically.

-> Importance :

A. Optimize Performance and reduce operational costs.

B. Ensure energy efficiency in low-power IoT device.

C. Handle Failures and maintain system reliability

D. Improve Accuracy, coverage and Overall network efficiency.

* Device / Cloud Collaboration Framework :

=> It refers to a computing model where devices interact with cloud computing infrastructur

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to perform tasks efficiently.

This framework ensures that computational workloads are distributed b/w devices and the cloud, optimizing performance and reducing latency.

=> Working:

1 Data Collection and Preprocessing:

Devices collect raw data from sensors, user inputs or environmental factors.

Basic processing is performed on the device itself to reduce data transmission loads.

2 Data Transmission:

Processed or raw data is sent to cloud servers via wireless networks.

Secure protocols are used to ensure safe data transfer.

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3 Cloud Processing and Analysis:

The cloud performs advance computing tasks.

Cloud services scale resources dynamically to handle large amounts of data.

4. Results and Actions sent Back to devices:

After Processing, the cloud sends back insights, updates or actions to the devices.

Devices act based on the received information.

=> Applications:

1 IoT Application:

Device / Cloud collaboration is crucial for IoT applications, where multiple smart devices work together with cloud platforms.

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Some examples include:
- Smart Watches and Fitness Bands
- Smartphones
- Smart Home Devices
- Smart cities
- Smart Monitoring
- Implants and Medical Devices.

2 Cloud Computing Applications:

Cloud computing provides scalable and on-demand services to various applications.

Examples include:
- Antivirus Applications
- Online Data storage
- Data Processing
- Email Applications
- Streaming Video Software
- Web Conferencing Applications.

Device / Cloud collaboration enables smart devices to function efficiently by leveraging cloud computing power for storage, analytics and AI-driven decision-making.

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* Process and Service IoT Lifecycle.

=> The IoT Lifecycle is broadly divided into two key aspects:

1) Process Lifecycle : Focuses on how an IoT device is developed, deployed and maintained.

2) Service Lifecycle : Focuses on how IoT services evolve over time.

There are main 5 stage in Lifecycle.

1 Ideation and Prototype:

This is the initial phase where the concept of the IoT product is developed.

Developers create a prototype to test feasibility.

Used to validate the idea and check if the product is Feasible.

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①	②	③	④
Ideation and Prototype	Manufacture securely	Provision and Deploy	Manage and Monitor

↓ ⑤ Update and Maintain

2 Manufacture Securely:

The Finalized prototype moves to mass production.

Security measures are embedded to protect the device from vulnerabilities.

Used to produce high-quality, secure IoT devices at scale.

3 Provision and Deploy:

The IoT device is configured and provisioned for real-world use.

Deployment includes setting up connectivity.

4 Manage and Monitor:

IoT devices are monitored remotely for performance and security.

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Data analytics and reports are generated for optimization.

5 Update and Maintain:

Devices receive Firmware and security updates via ImpSecure.

Long-term maintenance ensures reliability and security.