=> INTRO TO EDGE COMPUTING

Edge Computing is the Model. that Extends cloud Computing Services to the edge of N/W. This Model aims to move decision making operations as close as possible to data Sources. Transferring all the data from the N/W edge to the cloud data centres for processing may create latency problem & outstrip the N/W Bandwidth Capacity. To resolve this Issue, it is best to process data closer to the devices.

It may be referred as distributed IT architecture.

ORIGION OF EDGE COMPUTING

Edge Computing can be ~~traced~~ traced back of to 1990s when Akamai launched its content delivery N/W (CDN) which Introduces Nodes at location geographically closes to the End user. These Nodes store Cached Static content like Images. Edge Computing takes this concept further by allowing Nodes to perform basic Computational task
In 1997, Computer Scientist Brian Noble demonstrated how Mobile tech. could use edge computing for Speech recognition. Two years later, this method also used to Extend battery life of phones.
1999 Saw the arrival of peer to peer Computing.
In 2006, cloud Computing emerged with release of Amazon EC2 Service & Companies have adopted it in huge no's Since then. In 2009, the Case for VM based cloudlet in Mobile Computing was published dealing end to end relationship b/w latency & cloud Computing. In 2012 cisco Introduced fog computing This brings us to Current edge Solution.. Edge Computing became a key factor driving the adoption of technology IOT

Application of Cloud Edge Computing

① Smart System -

In this N/W comm. technologies are Interlenked with Sensors that are meant to send signals to the System to take action.

Smart System have several areas: -

→ Smart home
→ Smart city
→ Smart healthcare

② Smart grid -

It collect huge amount of Energy related data.

To reap the benefit of Smart grid, many smart metres. Sensors must be used to collected shared data in Smart grid.

③ Smart farm :-

To meet demands of food production, the agricultural sector has to Integrate IOT in various production. It can use edge computing to operate vehicles & to perform remote monitoring.

④ Video Analytics -

The rapid spread of phones & N/w cameras is giving rise to analytics technology.

Eg. - If child lost in City

In this case, edge computing model can be used to generate search report for child from cloud & transmit it to all things in target Area.

Advantages :-

→ offers high speed, Reduced latency better reliability
→ Better Security
→ less Expensive route to Scalability allowing Company to Expand their Computing capacity

→ less time & resources Needed for data
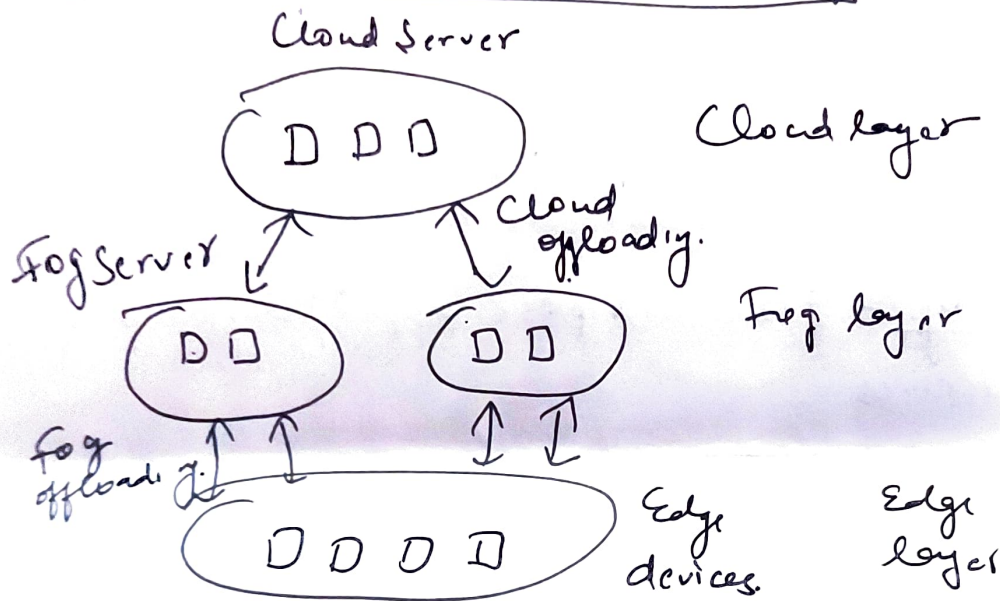
(2)

• Cons :-
→ Require more Storage Capacity
→ Security challenges due to huge data
→ only analyze data
→ Cost high

=> | ARCHITECURE OF EDGE COMPOTING |

Cloud Server

Cloud layer

Fog Server

Cloud
offloading.

Fog layer

fog
offloading.

Edge
devices.

Edge
layer

Instead of sending all data directly to the cloud or fog layer from edge devices, data is first processed at edge layer. Processing data at edge layer gives near real time response. As data generated at edge layer is huge, it cannot be handled entirely at edge layer. Hence it is offloaded to the cloud or fog layer. In cloud-fog Edge Scenario data from edge layer is first offloaded fog server. In Cloud-Edge Scenario data after processing on Edge layer can be offloaded to cloud layer as resources at edge layer is insufficient to handle large data. Hence edge layer can decide what is relevant there reducing load.

Component of Edge Compuly :—

→ **Cloud** — Can be public or private. which Can be repository for workloads like Application. These are host & run the application that are used to Manage Nodes.
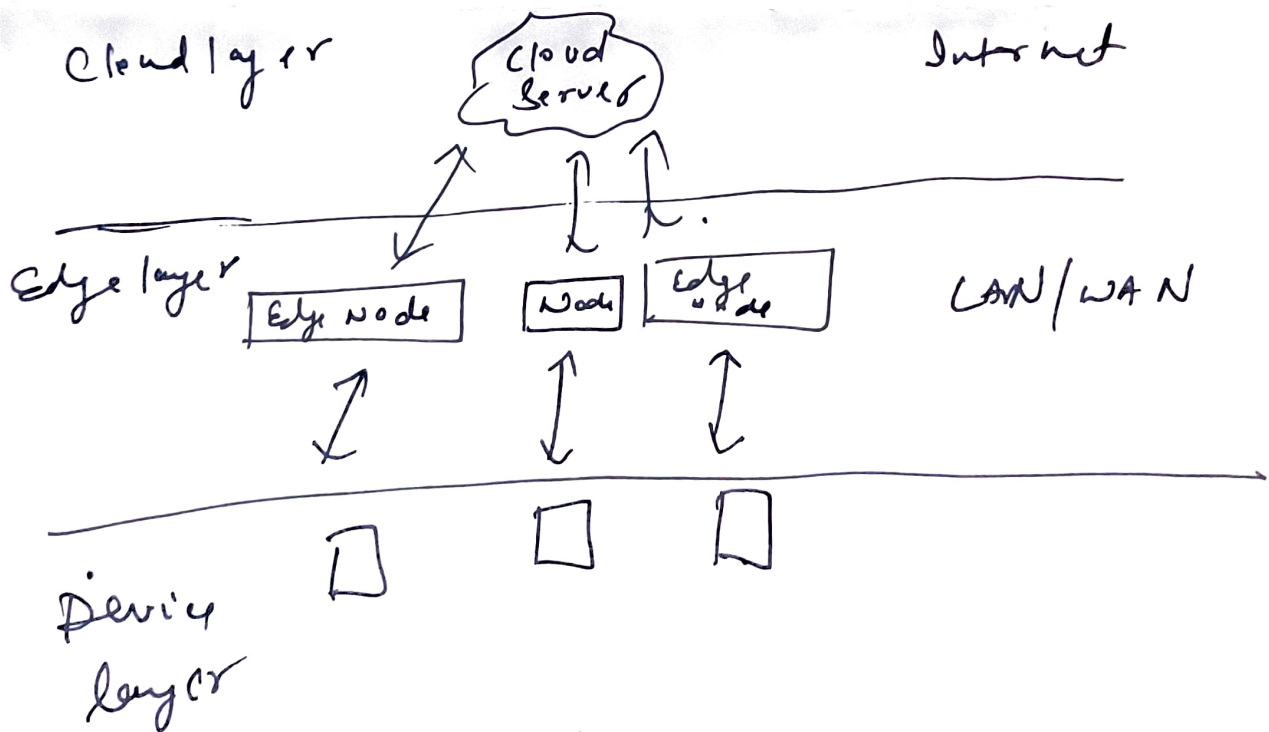
→ **Edge device** —
It has Compute Capacity that is Integrated into that device Ex:- ATM.

→ **Edge Node** — referred to any device, Server or gateway

→ **Edge Cluster/ Server.**
It is located In Remote operation facility like Hotel, bank. Runs Enterprise application workloads

→ **Edge gateway** — host enterprise appl^n; workload & Shared Services

Cloud layer   Cloud Server   Internet

Edge layer | Edge Node | | Node | | Edge Node | LAN/WAN

Device
layer   □   □   □

Architecture

⇒ | EDGE HELPING THE CLOUD |

Edge to cloud refers to the fact that Enterprise data is no longer confined to data Centre, it is being generated at edge in ever growing amounts. Procured & Stored in cloud.

In order to Extract business insight from data, it must flow Seamlessly b/w edges, clouds & data Centres & users in wide variety of work location & Environments.

Edge to Cloud is Necessary -
One approach is growing need for real time data driven decision making especially at edge. En:- Autonomous driving technology depends on AI, M/c learning System that can determine fraction of Second.

An Edge to cloud platform is designed to bring the cloud Experience to all of an organisation's apps & data.
It offers Consistent user Experience with Security.
It allows organization to pursue New business opportunities

How does Edge to cloud platform work -
To deliver a cloud Experience everywhere, a platform needs to incorporate Several characteristics :-

→ Self Service - organisations need the ability to Easily & quickly Spin up resources for New projects.
A true Edge to cloud platform provide a view into cost, usage etc.

→ Rapidly Scalable - To deliver on cloud's promise of agility, a platform ~~needs~~ needs to Include built in buffer Capacity, so, when more Capacity is needed, it is already Installed & ready to go

→ Pay as you go — Billing should be based on actual Capacity used. So business can get New projects up & running without heavy cost. & delay

→ Managed for you — It should lift the operational burden of managing & updating the Infrastructure, so IT can focus on building the business & revenue.

Benefits of Edge to cloud Technology —

→ Achieves greater agility — It gives organisaers the flexibility to respond quickly to requests from business.

→ Modernize application — Workload that may not be suited to move to public cloud can run efficiently on today's as a Service platform.

→ Develop hybrid cloud Strategies with Confidence — Organisaem can Easily create the optimal combinations of assets & quickly Switch b/w them

→ Realiy the transformational value of app & data — Some data are too large to make the move to cloud. An edge to cloud platform offers Max. availability & Min. latency.

⇒ | EDGE VS FOG COMPUTING |

Attributes	Cloud	Fog	Edge	④
1) Target users	Internet user	Mobile user	Internet user.	
2) location of Servers	Edge Nodes.	Within Internet	Very near to Edge Node.	
3.) Geographical distribution	Centralised	Distributed	Distributed	
4) Latency	Higher	less	less	
5) Connectivity type.	Leased Lines	wireless	wireless	
6.) N/w Bandwidth	Large	less	less	
7.) Security	less	more	less	
8.) Goal	To provide Scalable & Easy access for IT Service	To reduce the redundancy & work efficiently. when data is transferred for Processing, Storing	To reduce N/w Congestion & Improve appl^n Performance by Perform task closer to end user.	
9.) Transmission of data.	System to cloud	System to System	Device to Device	
10.) Architecture	Centralized	Distributed	Distributed	
11) No of Nodes	few	many	Many	
12) Latency	Low latency but greater than fog	Low latency in term of N/w	Low latency in term of N/w	
13) Speed of process	Depends on VM Connectivity	High	faster	

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APPLICATIONS OF EDGE COMPUTING

Edge Computing application.

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                    │                  │                          │
              Smart System          Video                   Collaborative
                                    Analysis                    edge

              ├── Smart home
              ├── Smart city
              ├── Smart health Care
              └── Smart grid
              ├── Smart Survillence
              └── Smart farm.
```