

**UNIT-IV**  
**CLOUD COMPUTING TECHNOLOGIES AND APPLICATIONS**

**1. How does Cloud Content Delivery Network Services works? Gives its benefit in Cloud Computing? Advantages and disadvantages?**

Ans :- **Content Delivery Network** :- CDN is a software service which solves distributed content delivery problems across all geographical regions.

1. In order to improve speed and connectivity, a CDN will place servers at the exchange points between different networks.
2. A CDN makes a number of optimizations on standard client/server data transfers. CDNs place Data Centers at strategic locations across the globe, enhance security, and are designed to survive various types of failures and Internet congestion.

The process of accessing content cached on a CDN network edge is almost always transparent to the user. CDN management software dynamically calculates which server is located nearest to the user making the request and delivers content based on those calculations. CDN edge servers communicate with the content's origin server to deliver cached content and new content that has not been cached to the user.

**Examples** :- AWS CloudFront is one of the popular content delivery service used by AWS business application users.

- i. Akamai
- ii. EdgeCast

A content delivery network (CDN) refers to a geographically distributed group of servers which work together to provide fast delivery of Internet content.

A CDN allows for the quick transfer of assets needed for loading Internet content including HTML pages, javascript files, stylesheets, images, and videos. The popularity of CDN services continues to grow, and today the majority of web traffic is served through CDNs, including traffic from major sites like Facebook, Netflix, and Amazon.

**Benefits of Using CDN**

- 1. Improving website load times** - By distributing content closer to website visitors by using a nearby CDN server (among other optimizations), visitors experience faster page loading times. As visitors are more inclined to click away from a slow-loading site, a CDN can reduce bounce rates and increase the amount of time that people spend on the site. In other words, a faster website means more visitors will stay and stick around longer.
- 2. Reducing bandwidth costs** - Bandwidth consumption costs for website hosting is a primary expense for websites. Through caching and other optimizations, CDNs are able to reduce the amount of data an origin server must provide, thus reducing hosting costs for website owners.
- 3. Increasing content availability and redundancy** - Large amounts of traffic or hardware failures can interrupt normal website function. Thanks to their distributed nature, a CDN can handle more traffic and withstand hardware failure better than many origin servers.
- 4. Improving website security** - A CDN may improve security by providing DDoS mitigation, improvements to security certificates, and other optimizations.

**The CDN advantages ☐**

- i. Faster response time due to factors like geographical proximity, network proximity etc. ☐

- ii. Providing support for different types of content including on-demand, streaming media ☐
- iii. Providing support for secure delivery of content ☐
- iv. Efficient distribution of content to all the resources (typically all the servers in the content delivery network) ☐
- v. Provide unique ways to improve performance of network thereby providing ways to utilize bandwidth efficiently

### **Some of the Disadvantages of CDN :-**

#### **1. Good Things Come With Extra Cost**

The most prominent downside to using a CDN is the charges that come with it. Since CDNs are mostly ideal for large traffic websites, these tend to come with a large chunk of money.

#### **2. Location of Servers**

If there's a mismatch between the location of your servers and that of your audience, then CDNs won't be of much help to you.

So, it's really important to know your audience's geography and have the CDN servers placed accordingly.

#### **3. Support can be an Issue**

Since CDNs are mostly operated over third-party infrastructures, resolving an issue can involve too much to-and-fro of communication.

### **Q2. What do you understand by Multi-CDN ? How does it work? Give one best example of Multi-CDN and the benefit of Meta-CDN?**

Ans :- Multiple CDNs are a way to combine the strengths of different CDN vendors, while minimizing the weaknesses of each. A single CDN provider, for example, might have great coverage in Asia, while another CDN vendor might have great coverage all over the USA and Europe. When you use a multi-CDN service, you can route traffic to different CDNs in a way that makes the most sense when it comes to performance and availability

If your business application needs are purely global and require multiple servers across the globe to give each user a faster website loading experience irrespective of their locations, then this concept of Multi-CDN comes into pictures.

**META-CDN :-** This is a company which provide multi-CDN.

- i. It combines existing CDN providers into one huge global network.
- ii. It dynamically combines and optimizes all major cloud service providers and infrastructures providers quickly and securely speed up the Web contents to users.

Some of the Key features of META-CDN are as follows

**Global Presence :-** The business application of any user gets massive amount of CDN locations which is not possible with one single CDN provider.

**Faster Content delivery :-** MetaCDN always selects the best optimal server for individual users. If there are multiple CDN providers in one region, Users will always get the content from the faster one within that region.

**Always uptime :-** MetaCDN gives guarantee of 100% service uptime: because if one CDN network goes down, MetaCDN immediately routes the traffic through another provider.

### Q3. What is the Advantages and Disvantages of CDN ?

Ans :- **Pros:**

- i. **Avoid a single point of failure:** Using multiple content delivery networks can ensure 100% availability. In the case of a content delivery network outage, the current CDN can be replaced with another CDN.
- ii. **Performance benefits:** Multiple CDNs means more servers and reduced latency. Lower latency and faster loading times mean less lagging and buffering.
- iii. **Enhanced security:** A common type of cyber attack is called DDoS, where basically bad actors try to overload a server or network to cause it to fail. Think of a traffic jam. In a setup with multiple CDN providers, if the servers from one CDN gets attacked, traffic can just be rerouted and “fall over” to the servers of another CDN.
- iv. **Lower bandwidth costs:** Different CDN providers offer cheaper rates in certain regions. When setting up a multi-CDN strategy, you can route to the cheaper option.
- v. **Scalability:** With multiple CDNs, you can better handle traffic spikes or virality. By using a multi CDN service, there are more servers to distribute the load and to handle requests, so the chance that any one server will be overloaded and fail is practically nonexistent.
- vi. **Reach remote areas:** Generally, the closer a user is to a server, the lower the latency. Although data moves very fast today, it can’t travel faster than the speed of light. For that reason, distance will likely always play a role in video performance. Having strategic multiple CDN providers gives you more distributed edge servers, making it possible to deliver high-quality video experiences to more remote areas.

**Cons:**

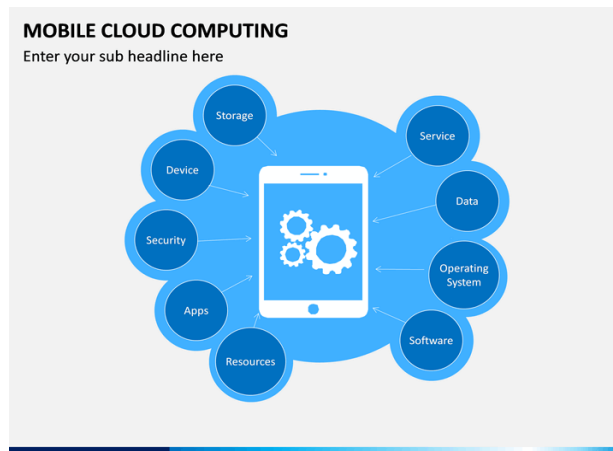
- i. **Need to pay extra attention to configurations:** You need to ensure configurations are the same across all CDN providers. For example, in reference to simple multi-CDN load balancing, you want to make sure that if you blacklist European traffic on one CDN, you also blacklist it on others.
- ii. **Measuring performance may take longer:** With multi CDN providers comes multiple capture logs to sort through to measure performance.
- iii. **Integration and training costs:** Unless you have the technical knowledge to integrate a multi CDN strategy, you may have to hire experts or invest in a multi-CDN service solution that can help you manage multiple CDNs.
- iv. **More strategic thinking required:** Choosing how to allocate specific workloads and determining which content delivery network will serve which user or session based on whichever rules requires some technical know-how.

### Q4. What do you understand by Mobile Cloud Computing? Explain with suitable Diagram? What is it benefits and Challenges ?

Ans :- Mobile cloud computing is a concept related to cloud computing and it brings services such as on-demand access and no on-premise software.

1. Mobile Computing uses network capabilities alone to deliver the desired service to customers and charges for their use.
2. It could permit the user to reserve network bandwidth.
3. MCC is a new paradigm for mobile applications where the data processing and storage are moved from the mobile device to cloud.
4. The mobile phone world is dependent on two factors
  - i. Network stability
  - ii. Handset availability.

Mobile phone do not have adequate processing power or memory to support huge amount of data. Cloud computing seems to be the great idea solution for these mobile phone users.



## Benefits of Mobile Cloud Computing

1. Mobile Cloud Computing saves Business money.
2. Because of the portability which makes their work easy and efficient.
3. Cloud consumers explore more features on their mobile phones.
4. Developers reach greater markets through mobile cloud web services.
5. More network providers can join up in this field.

## Challenges of Mobile Cloud Computing

1. **Low bandwidth:** This is one of the big issues in mobile cloud computing. Mobile cloud use radio waves which are limited as compared to wired networks. Available wavelength is distributed in different mobile devices. Therefore, it has been three times slower in accessing speed as compared to a wired network.
2. **Security and Privacy:** It is difficult to identify and manage threats on mobile devices as compared to desktop devices because in a wireless network there are more chances of the absence of the information from the network.
3. **Service Availability:** Users often find complaints like a breakdown of the network, transportation crowding, out of coverage, etc. Sometimes customers get a low-frequency signal, which affects the access speed and storage facility.
4. **Alteration of Networks:** Mobile cloud computing is used in a different operating system driven platforms like Apple iOS, Android, and Windows Phone. So it has to be compatible with different platforms. The performance of different mobile platform network is managed by the IRNA (Intelligent Radio Network Access) technique.
5. **Limited Energy source:** Mobile devices consume more energy and are less powerful. Mobile cloud computing increases battery usage of mobile devices which becomes an important issue. Devices should have a long-life battery to access applications and other operations. When the size of the altered code is small, the offloading consumes more energy than local processing.

**Q5. How will you explore about the InterCloud issues? What are its Advantages and challenges in InterCloud?**

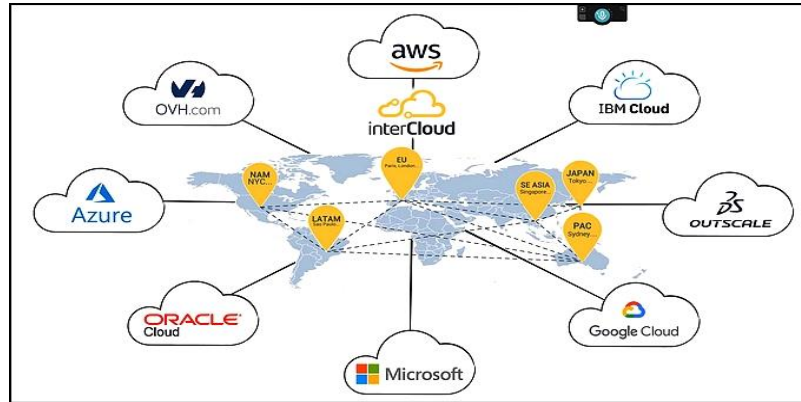
Ans :- Intercloud is a global “ Cloud of Clouds” which describes a service pattern and agreement among cloud providers to build interconnected cloud services for providing flexibility and enhanced experience to users.

**Grid of Clouds :-** When more providers work and operate together is called a grid of clouds.

**Advantage :-**

The key benefits of InterCloud is that it solves cloud interoperability issues.

If the Vendor lock-in problems occurs, it can be resolved this issues with the help of Intercloud.



Cloud providers face some specific challenges when trying to implement Intercloud are as follows

1. **Lack of Standards** :- Since cloud computing standards are evolving and research is ongoing on various developing standards, Cloud resources such as virtual machine provisioning , Object and Block storage cannot be standardized for all cloud providers in InterCloud

In terms of conventions, addressing, messaging, etc. proper management is required to solve this challenges.

2. **API translation** :- There should be common interface for all cloud providers that are parts of InterCloud. This common interface should be responsible for API or other service request translations between two providers.
3. **Security** :- Following are some possible security-related threats when InterCloud starts working
  - i. Task and services migration from one cloud provider to another provider
  - ii. The question about who should monitor the common administration among all clouds.
- iii. Managing public key infrastructure of InterCloud.
- iv. Agreement on Common encryption and decryption protocol for all cloud providers.