# Exercise: Computer Network Architectural Models

Answer the following questions in detail:

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**Question 1:** Explain the difference between the three-layer client-server architecture and three-tier client-server architecture.

1. Layer is logical separation of code and Tier is physical separation of code.In other words we can say Tiers are the physical deployment of layers. Or a Tier becomes a Layer if it could be physically separated from the Layers it consumes.
2. In 3 layer architecture, the Database Access Layer (DAL), Business Logic Layer (BLL) and User Interface Layer (UIL) resides as 3 different project and the output of these 3 projects (.dll file) must be together in the same server or on same machine in order for the system to run.However in 3 tier architecture, the Database Access Layer (DAL), Business Logic Layer (BLL) and User Interface Layer (UIL) reside as 3 different projects. But each of the projects can be deployed at the different server or at the different machines and distributed functionality is explored.
3. In 3 layer architecture DAL, BLL and UIL can work on same machine where as in a 3 Tier architecture a client in on one machine, the application Server is hosted in another machine and the database server resides in another machine i.e. Three-tier is a client–server architecture in which the User Interface, Business Logic , Data Storage and Data Access are developed and maintained as independent modules on separate platforms.
4. In 3 Layer we have distinct namespaces and classes for the various layes i.e. we’re only talking about logical organization of code and passing objects between layers is easy as all assemblies will run under same application in single machine.But 3 tier applications are not straight as 3 layers, because each layer will be deployed in different machines. So here, we need a mechanism to send the objects between different machines over the network hence we use technologies called Web Services, Remoting or WCF, etc. in order to implement 3 tier applications.

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**Question 2:** What is an overlay network and why do we use it to build peer-to-peer networks?

* An overlay network is a network that is built on top of another network.Overlay network node are connected with each other through a logical or virtual link which corresponds to a path in the underlying network.Multiple overlay networks can exist on top of the same underlying network,where each implements its own specific service.
* Reason:An overlay network enables new services or functions without requiring a complete network redesign. It decouples network services from the underlying network by encapsulating a packet inside another packet, which is de-encapsulated at the endpoint.

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**Question 3:** Would you design a structured or unstructured peer-to-peer distributed system and why?

I would design a structured,

Because it is based on a specific structure, it will be faster to search for data and resources, and its churn rate will be lower compared to unstructured, and it will have higher security.

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**Question 4:** Why would you choose a client-server architecture and why would you not choose it?

We choose client-server architecture because:

1. in the model, redundant resource data and operations are controlled by dedicated servers, so the network and security it provides are more reliable,
2. It divides application processing into multiple layers, improving application development and processing.
3. Scalability: The client-server architecture is scalable, we can add new services and resources to the network to meet growing demands,
4. Backup and restore:More data can be recovered than in a decentralized or peer-to-peer model,
5. Reduced data replication: data is stored on the server instead of the client, reducing the amount of data replication

We don’t choose client-server architecture because:

1. Overloading — Every Time you have a risk of collapse or deceleration of your connection when a lot of clients make a request at the same time. So there is always a small chance not to reach necessary information. That is why in business-critical software architecture is complicated and even duplicated. On our projects we use a cluster of servers – one fell, the rest are working. Put a balancer in front of the servers, and the client sends the request there. No matter how many servers are put into the cluster, the client is not interested. It has one URL – the address of the balancer. This scheme is used for a high-load application – when there are so many requests that one server simply cannot handle them. Amazon, Facebook and other giants have been working like this for dozens of years.
2. Cost — Servers are expensive. You can’t put a normal SSD in there just like a home computer. Why? Because hardware for servers has quite different requirements for reliability and also there is support for specific functions.
3. Maintenance of servers: Maintenance of servers is a complex task, because the server provides services continuously, so the problem needs to be solved in time without any delay
4. Availability:The server must always be online and have services available to the client, otherwise the client will not work.

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**Guidance Links for Writing Answers:**

Client-Server Architectural Model: 3-Layer Client-Server Architecture, 3-Tier Client-Server Architecture, Advantages & Disadvantages

<https://youtu.be/OTCYvBPHcdo>

Peer-to-Peer Architectural Model: Overlay Network, Unstructured P2P Network, Structured P2P Network, Advantages & Disadvantages

<https://youtu.be/5TlXplq3wv4>