What is Network Topology Architecture?

In tech, network topology architecture refers to an overall view of any organization's network infrastructure. The terms network topology and network architecture are often used separately. Let's know what these terms stand for!

Network Topology:

- Network topologies give us an overview of logical and physical network layouts containing links and nodes.
- The **physical topology** refers to the configuration of computers, cables, or other peripherals, etc.
- The **logical topology** allows us to pass information between workstations.
- The different types of network topologies are:
  - Bus topology
  - Mesh topology
  - Star topology
  - Ring topology

Network Architecture:

- The network architecture tells us a detailed picture of resources and network layers.
- In other words, it shows us the overall design of a computer network.
- It presents the logical and structural layout of networking systems and the related hardware devices such as routers, switches, etc.

Types of Network Topology Architectures Here

There are various types of network topology architectures. We are going to discuss the characteristics of the following network topology architectures:

- Three-Tier Architecture
- Two-Tier Architecture
- Spine Leaf Architecture
- WAN Architecture
- SOHO Architecture
- On-Premise/Cloud Architecture

Let's discuss each one of them one-by-one!

1. Three-Tier Architecture

According to Cisco, networks have been divided into layers or tiers for better understanding. The three-tier architecture is one of the oldest and classic **networking** models.

As the name suggests, the three-tier architecture consists of the following 3 layers:

- Access Layer (bottom layer)
- Distribution Layer (middle layer)
- Core Layer (Topmost layer)
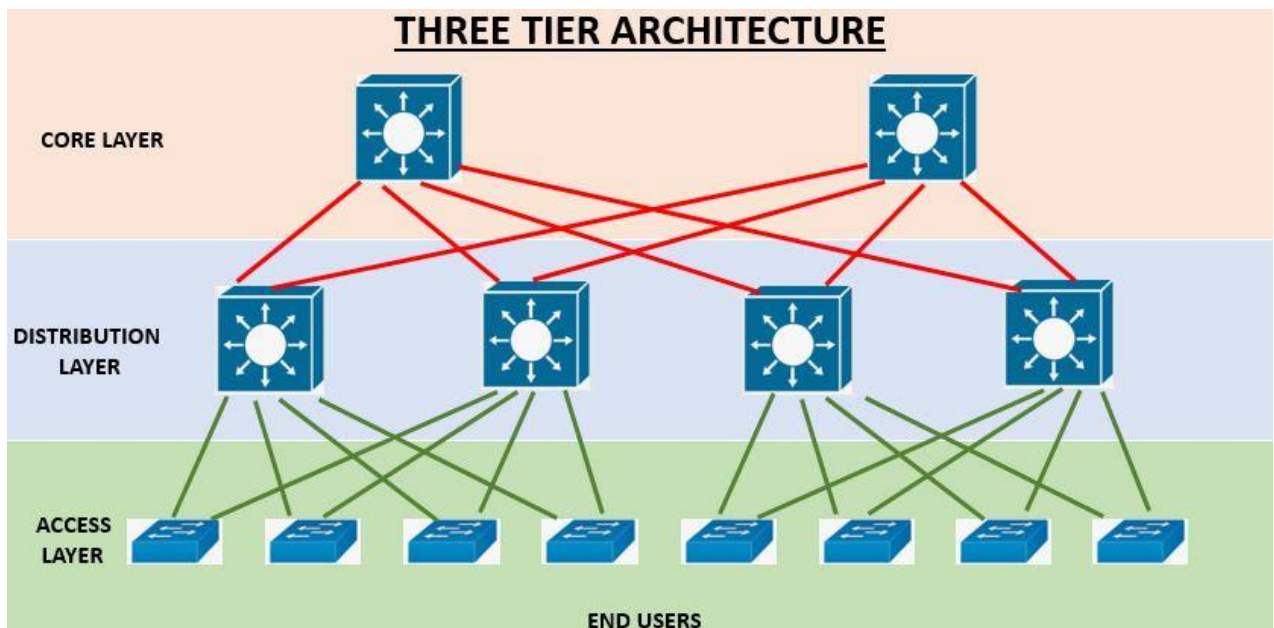
Let's discuss each one of them.

Access Layer:

- The access layer is the lowest layer in the 3-tier architecture.
- It is also called as **workstation layer**.
- It is the closest layer to the end users.
- It consists of **access switches**.
- These switches connect users to the network.

Distribution Layer:

- It is the middle layer in the three-tier architecture.
- The distribution layer is also, sometimes, referred to as the **aggregation layer**.
- It performs quality of service and security work.
- It consists of **multilayer switches**.
- It moves the traffic from the access layer to the core layer.
- It aggregates LAN and WAN links.

Core Layer:

- It is the topmost layer in the three-tier architecture.
- The Core layer also has another name which is the **backbone layer**.
- It connects distribution layer devices.
- It performs high-speed transport of traffic.
- It is reliable and fault-tolerant.

2. Two-Tier Architecture:

The two-tier architecture is more popular architecture than three-tier architecture these days.

- It has a **collapsed core**. It is called so because it has a blended or collapsed distribution layer and core layer.
- Therefore, the two-tier architecture consists of only 2 layers:
    1. Access Layer
    2. Collapsed Core Layer
- It is therefore simpler.

Spine and leaf is the most popular two-tier architecture.
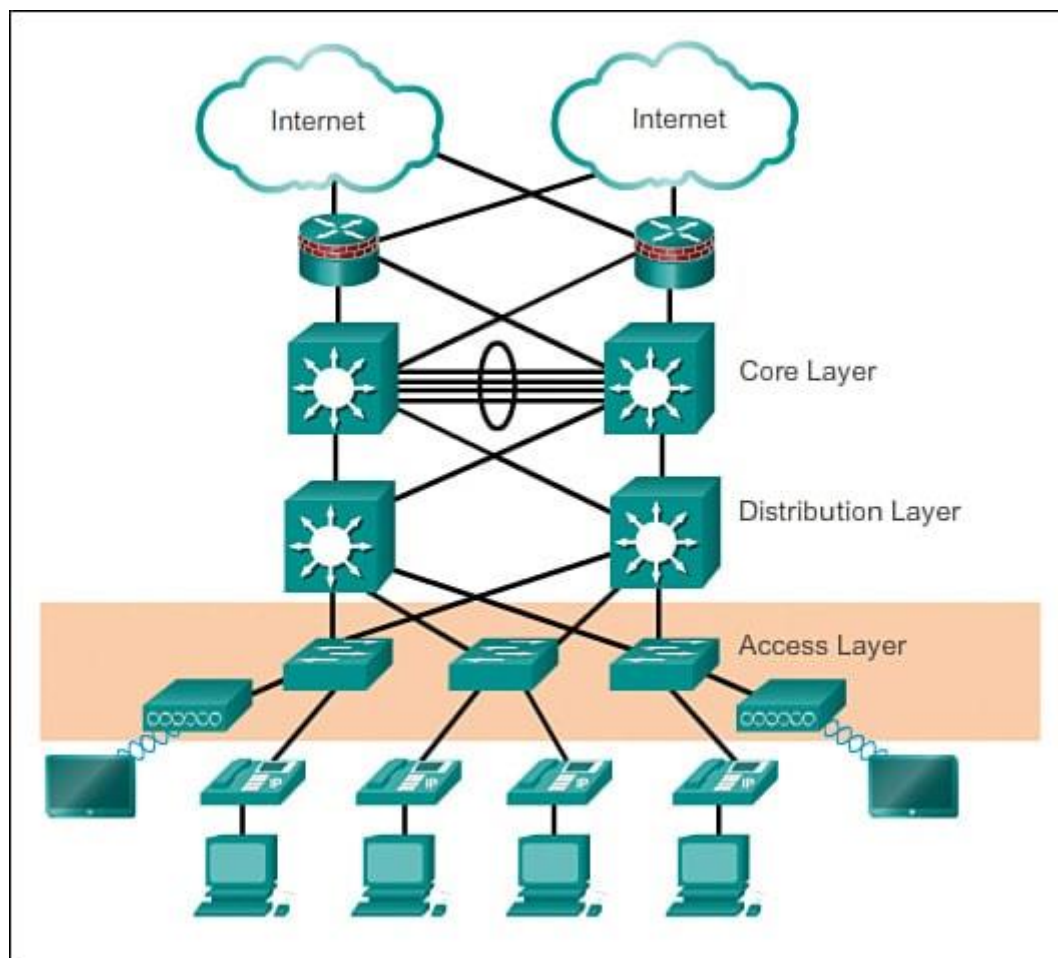
3. Spine Leaf Architecture

- Spine Leaf architecture is a two-layer or two-tier architecture.
- It is mostly used in **data centers**.
- It has **low latency**.
- It consists of two layers:
    1. Spine Layer
    2. Leaf Layer

Spine Layer:

- The spine layer is the top layer.
- The Spine layer consists of very intelligent devices such as **Cisco Nexus 9000** devices.
- These devices have ACI Controller intelligence inside them.

Leaf Layer:

- It is the bottom layer in the spine leaf architecture.
- It consists of access switches.
- Each leaf is connected to every spine device.

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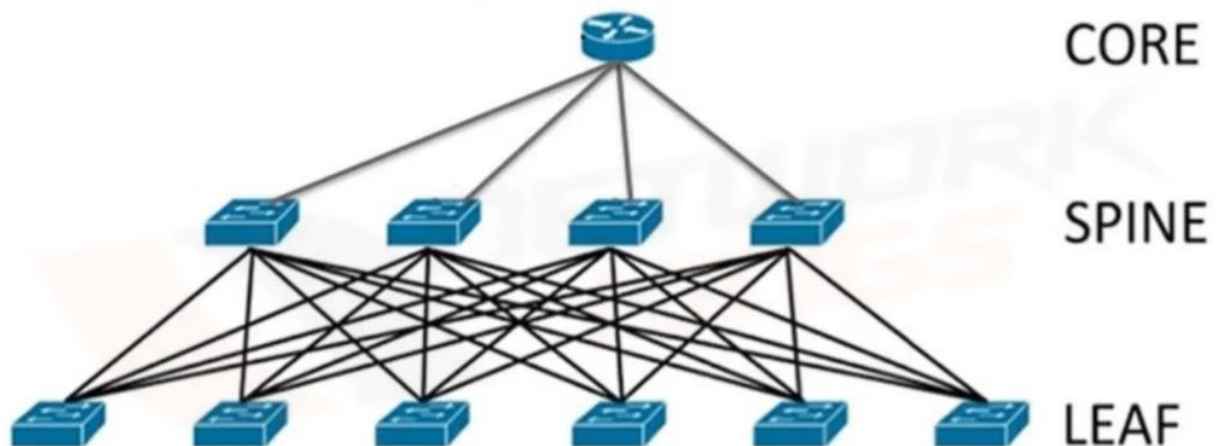
4. Small Office/Home Office (SOHO) Architecture:

- The SOHO architecture consists of the simplest architecture.
- As the name suggests, it is mostly used in homes and/or small enterprises.
- This type of architecture consists of **three** components:
    1. A small switch
    2. A router
    3. Connected access devices such as printers, PCs, etc.
- Usually, a **single device** is used that acts as both a switch and router.
- The devices are hardwired into this router.

This router also acts as a **firewall**.
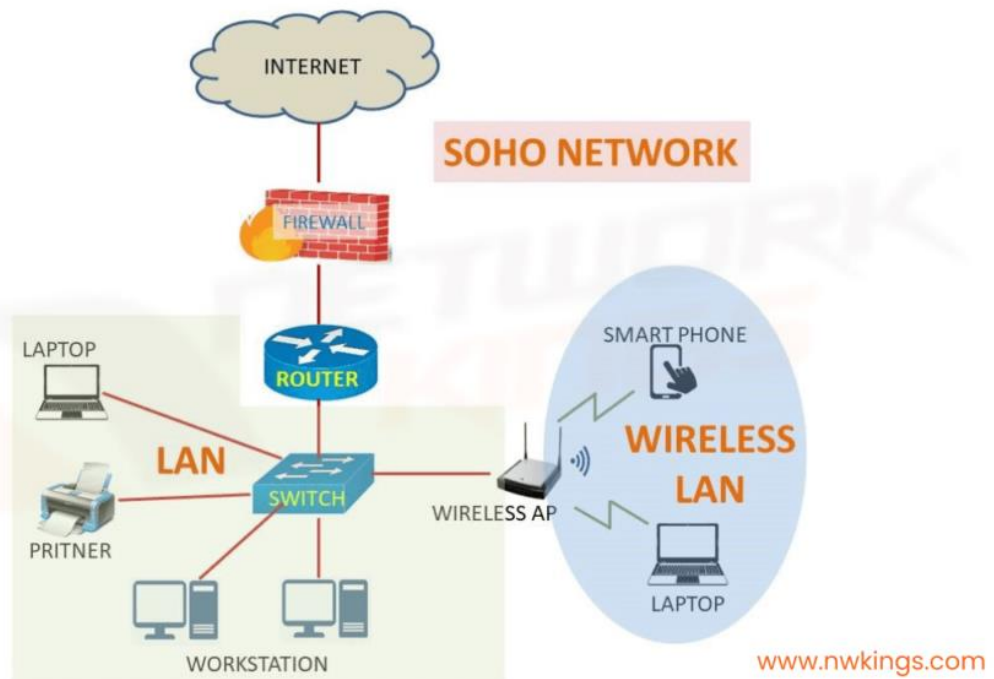
5. Wide Area Network (WAN) Architecture:

Imagine this. You have a SOHO network at home and you've connected multiple access points. These access points are making wide-area network connections out to multiple **Internet Service Providers** (ISPs).

There are two types of connections formed in the WAN architecture:

- **The Primary Connection:**

First is the WAN connection formed by the access point using Digital Subscriber Loop (DSL).

- **Emergency Connection:**

The second is a low-cost WAN connection using an asymmetric DSL, meaning there is a difference between download and upload speeds. This is the connection to reach out to cloud resources.

These connections are referred to as **dual-homed configurations**. Such a connection is very strong because if one ISP connection fails, the second one takes the charge.
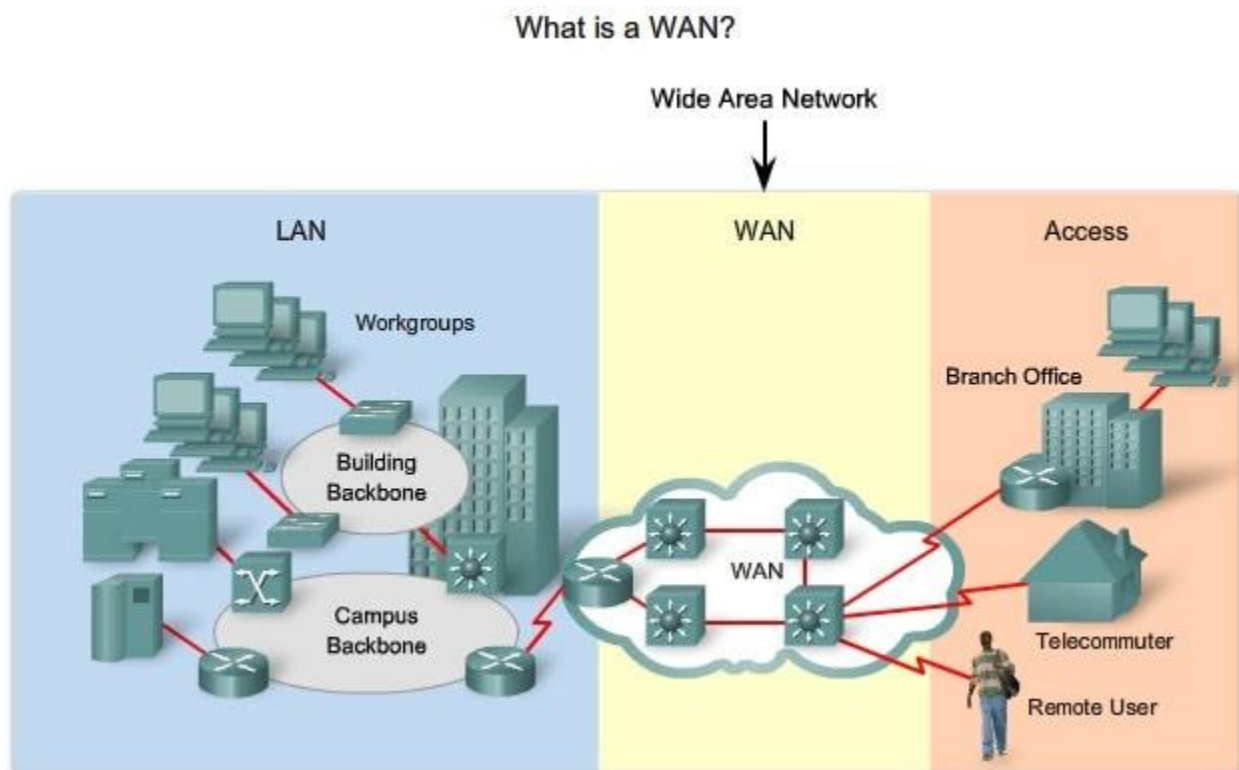
In today's time, better **client connectivity technologies** are available in the market. These are:

MPLS:

- **Multiprotocol Label Switching (MPLS)** is a transportation technique for high-performance telecommunication networks.
- It transfers data from one network node to another node on short path labels.
- MPLS can carry packets of various network protocols, therefore, called multiprotocol.

Metro-Ethernet:

- Metro Ethernet network is mostly used to connect clients to a large service network.
- Metro Ethernet provides multiple configuration options such as point-2-point, point-2-multipoint, multipoint-2-multipoint, etc.

Internet VPN:

- It consists of the following:
  - Dynamic Multipoint VPN (DMVPN)
  - Site-to-Site VPN
  - Client VPN

- **DMVPN** is dynamic, meaning it can build VPN connections when required and it can break them when not needed.
- Site-to-Site VPN links allow the creation of VPN links when sending protected data over a non-trusted network such as the Internet.
- **Client VPN** allows remote access to corporate resources.

6. On-Premises and Cloud Architecture:

Cloud technologies have developed virtual service models.

- **SaaS:**

Cloud architecture is more of an as-a-service model than a network topology. For example, if you're using Google Docs on the cloud, you're not aware of its network topology. This refers to as **Software-as-a-Service** (SaaS).

- **PaaS:**

If you're working with **Platform-as-a-Service** (PaaS), you might be familiar with the cloud topology. You can access any development resource using PaaS such as Operating Systems to test out any application.

- **IaaS:**

When you're setting up a cloud-based network topology, you're using Infrastructure-as-a-Service (IaaS). Networks, servers, and firewalls are organized in the topology as virtualized components.


Architecture of Cloud Computing
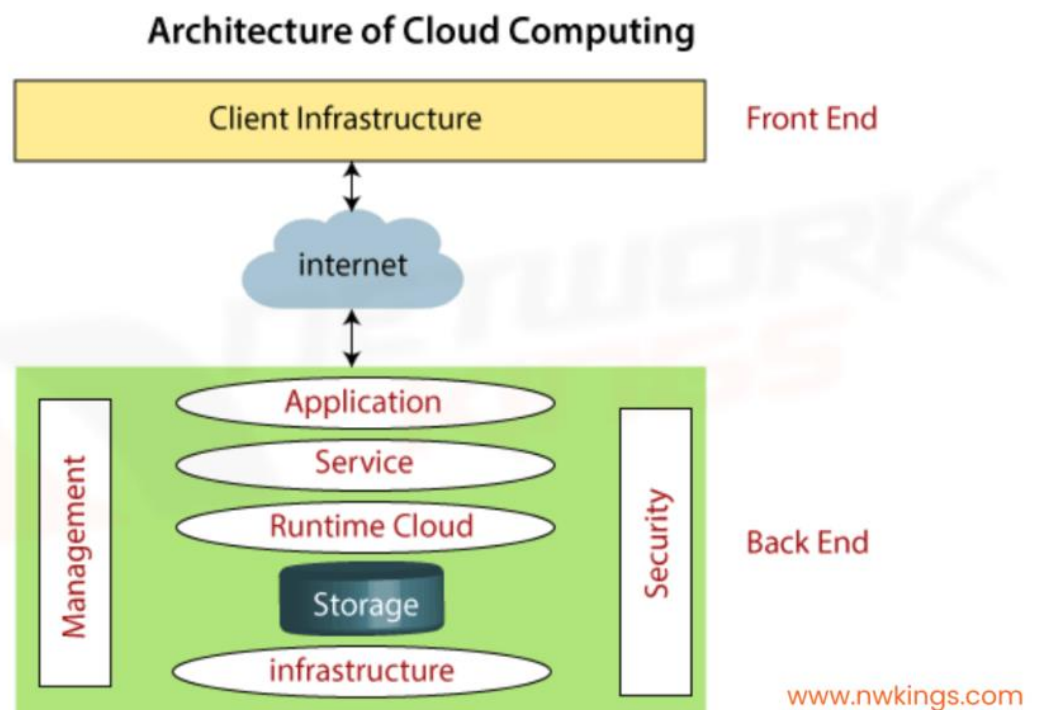
Conclusion:

That's all about the different network topology architectures. These architectures help us know better about the network topologies and how each network component functions in the topology.

1. Two-Tier Database Architecture

In two-tier, the application logic is either buried inside the User Interface on the client or within the database on the server (or both). With two-tier client/server architectures, the user system interface is usually located in the user's desktop environment and the database management services are usually in a server that is a more powerful machine that services many clients.
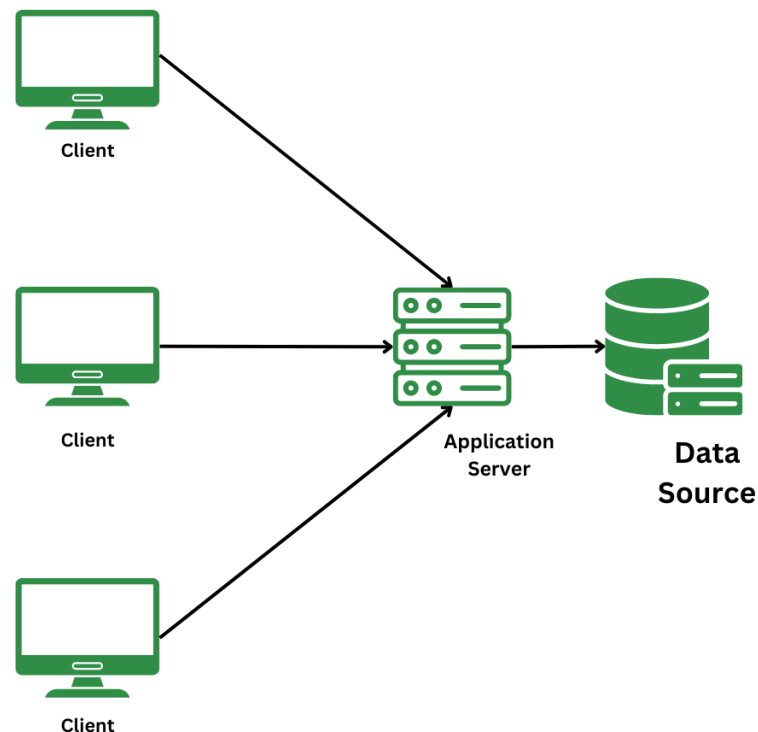

Two Tier Architecture
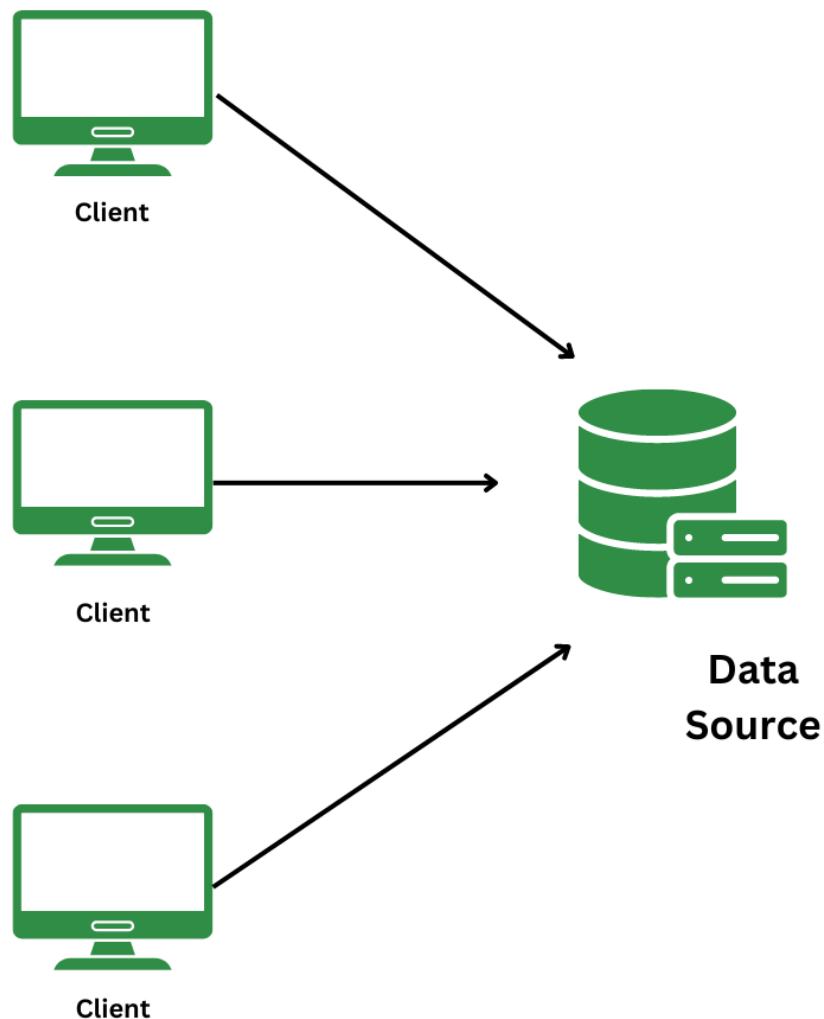
Three-Tier Database Architecture

In the three-tier, the application logic or process lives in the middle tier, it is separated from the data and the user interface. Three-tier systems are more scalable, robust and flexible. In addition, they can integrate data from multiple sources. In the three-tier architecture, a middle tier was added between the user system interface client environment and the database management server environment. There are a variety of ways of implementing this middle tier, such as transaction processing monitors, message servers, or application servers.

Three Tier Architecture

Three Tier Architecture

Difference Between Two-Tier And Three-Tier Database Architecture

Two-Tier Database Architecture	Three-Tier Database Architecture
It is a Client-Server Architecture.	It is a Web-based application.
In two-tier, the application logic is either buried inside the user interface on the client or within the database on the server (or both).	In three-tier, the application logic or process resides in the middle-tier, it is separated from the data and the user interface.
Two-tier architecture consists of two layers : Client Tier and Database (Data Tier).	Three-tier architecture consists of three layers : Client Layer, Business Layer and Data Layer.
It is easy to build and maintain.	It is complex to build and maintain.
Two-tier architecture runs slower.	Three-tier architecture runs faster.
It is less secured as client can communicate with database directly.	It is secured as client is not allowed to communicate with database directly.
It results in performance loss whenever the users increase rapidly.	It results in performance loss whenever the system is run on Internet but gives more performance than two-tier architecture.
Example – Contact Management System created using MS-Access or Railway Reservation System, etc.	Example – Designing registration form which contains text box, label, button or a large website on the Internet, etc.