Chapter-Two
Issues of Web Technology

Architectural Issues of Web Layer

- The web layer is also referred to as the UI (User Interface) layer. The web layer is mainly concerned with presenting the user interface and the behavior of the application that means handling the user interactions and events.
- While the web layer can also contain logic, core application logic is usually located in the services layer.
- The three layers included within the web layer are:
  I. HTML Layer (Content Layer)
  II. CSS Layer (Style Layer)
  III. JavaScript Layer (Behavior Layer)

I. HTML Layer

- HTML Layer is a content layer where you can store all the content that your customer want to read or look at.
- This layer includes text and image as well as audio and video i.e. multimedia.
- It is also important to make sure that every aspect of your site is represented in the content layer.

II. CSS Layer

- CSS Layer stores all your styles for your Web site in an external style sheet.
- This defines the way the pages should look ad you can have separate style sheets for various media types.
- Store your CSS in an external style sheet so that you can get the benefits of the style layer across the site.

III. JavaScript Layer

- JavaScript Layer is also known as behavior layer. This layer is the most commonly used language for writing the behavior layer. ASP, CGI and PHP can also generate web page behavior.
- However, when most developers refer to the behavior layer, they mean that layer that is activated directly in the Web browser so that JavaScript is nearly always the language of choice. You use this layer to interact directly with the DOM (Document Object Model).

Benefits of Separating the Layers:

- Some of the benefits of separating the layers are:
  i. Shared Resources

- When we write an external CSS file or JavaScript file, we can use that file by any page on our web site. There is no duplication of effort and whenever the file changes, it change for every page that uses it without you making more than one change.

ii. Faster Download

- Once the script or style sheet has been downloaded by customer the first time, it is cached. Then every other page that is downloaded loads more quickly in the browser window.

iii. Multi-person teams

- If we have more than one person working on a web site at once, we can divide up the workload without worrying about permission or content management.
- We can also hire people who are style and design experts to work on the CSS while our script works on the JavaScript and your writers work in the content files.

iv. Accessibility

- External style sheets and script files are more accessible to more browsers because they can be ignored more easily and because they provide more options. For example, you can set up a style sheet that is displayed only for screen readers or a script library that only used by people on cell phones.

v. Backwards compatibility

- When you have a site that is designed with the development layers, it will be more backwards compatible because browsers that can use technology like CSS and JavaScript can still view the HTML.

Tier Technology

- A tier technology is a software architecture in which different software components organized in tiers or layers to provide the dedicated functionality of software.
- It involves the three layer namely i.e. Presentation Layer, Business Layer and Data Layer.

❖ Presentation Layer

- Presentation layer is referred to as Client layer. It is top most layer of the application. It is user visible layer when we use software. By using this layer we can access the web page.
- The main function of this layer to communicate with application layer. This layer passes the information which is given by the user in terms of keyboard actions, mouse clicks to the Application Layer.

❖ Application Layer

- Application layer is also known as Business Logic Layer which is also known as logical layer.

- ☞ As per the gmail login page example, once user click on the login button, application layer interacts with the database layer ad sends required information to the presentation layer.
- ☞ It controls the application functionality by performing detailed processing. This layer acts as mediator between the Presentation and the Database layer.
- ☞ The complete business logic will be written in this layer.

❖ **Data Layer**

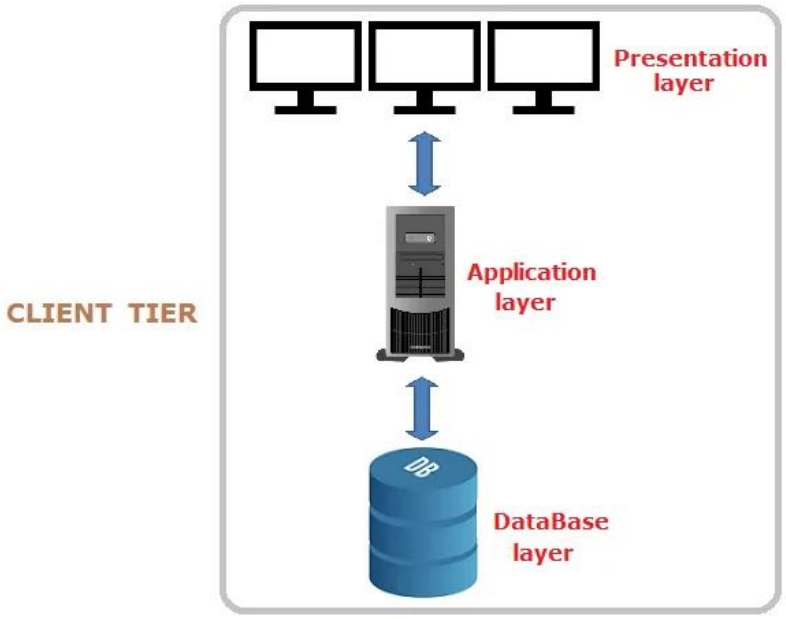
- ☞ The data layer is used to store data in this layer. Application layer communicates with Database layer to retrieve the data.
- ☞ It contains the methods that connects the database layer and perform required action like insert, update, delete operation.
- ☞ It is used to share and retrieve data from the database.

Types of Tier Technology Architecture

- Software architecture consists of One Tier, Two Tier, Three Tier and N-Tier architecture.

1. One Tier Architecture

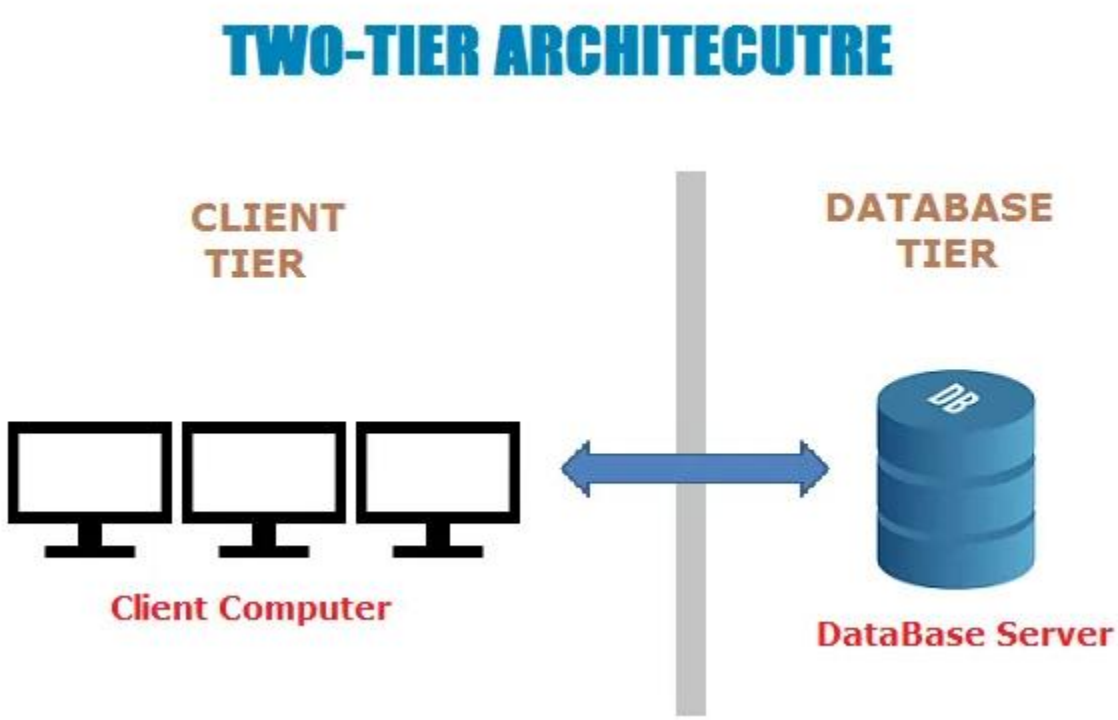
- One tier architecture consists of all the required components for a software application or technology on a single server or platform.
- It has all the layers such as Presentation, Business, Data Access layers in a single software package.
- An application which handles all the three tiers such as MP3 player, MS-Office are come under one tier application. The data is stored in the local system or a shared drive. Figure below illustrate the one tier architecture as:



2. Two Tier Architecture

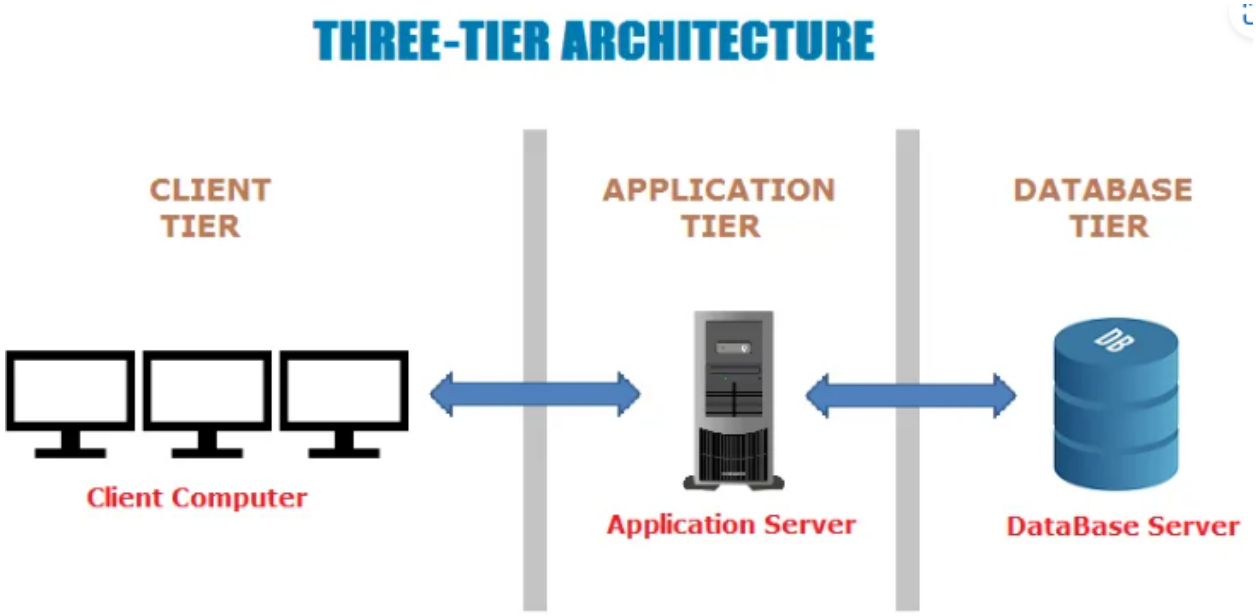
- A two tier architecture is a software architecture in which a presentation layer or interface runs on a client and a data layer or data structure gets stored on a server.
- Separating these two components into different locations represents into different locations represents two-tier architecture, as opposed to single-tier architecture.
- The two tier architecture is divided into two parts:
    i. Client Application (Client Tier)
    ii. Database (Data Tier)
- Client system handles both Presentation and Application layers and Server system handles Database layer. It is also known as client server application.
- The communication takes place between the Client and the Server.

- The client system sends the request to the Server system and the Server system processes the request and sends back the data to the Client System. Figure below illustrate the two tier architecture as:



3. Three Tier Architecture

- The three tier architecture is a client-server architecture in which the functional process logic, data access, computer data storage and user interface are developed and maintained as independent modules on separate platforms.
- It is a modular client-server architecture that consists of a presentation tier, an application tier and a data tier. The data tier stores information, the application tier, an application tier handles logic and the presentation tier is a graphical user interface (GUI) that communicates with the other two tiers.
- The three tier are logical, not physical and may or may not run on the same physical server. Figure below illustrate the three tier architecture as:



- The three tier architecture divided into three parts:
  1. Presentation layer (Client Tier)
  2. Application layer (Business Tier)
  3. Database layer (Data Tier)

1. **Presentation layer (Client Tier):**

- This layer occupies the top level and displays information related to services available on a website. This tier communicate with other tiers by sending results to the browser and other tiers in the network.

2. **Application layer (Business Tier):**

- It is also called the middle tier, logic tier, or business logic, this tier is pulled from the presentation tier. It controls application functionality by performing detailed processing.

3. **Database layer (Data Tier):**

- Houses database servers where information is stored and retrieved. Data in this tier is kept independent of application servers or business logic.

Advantages of Three-tier architecture

- The benefits of using a three tier architecture include improved horizontal scalability, performance and availability. With three tier, each part can be developed concurrently by different team of programmers coding in different languages from the other tier developers. Because the programming for a tier can be changed or relocated without affecting the other tiers, the 3-tier model makes it easier for an enterprises or software packager to continually evolve

an application as new needs and opportunities arise. Existing applications or critical parts can be permanently or temporarily retained and encapsulated within the new tier of which it becomes a component.

4. N-Tier Architecture

- ☞ N-tier architecture is also called multi-tier architecture because the software is engineered to have the processing, data management and presentation functions physically and logically separated. That means that these different functions are hosted on several machines or clusters, ensuring that services are provided without resources being shared and as such these services are delivered at top capacity. The "N" in the name n-tier architecture refers to any number from 1.
- ☞ Not only does your software gain from being able to get services at the best possible rate, but it's also easier to manage. This is because when you work on one section, the changes you make will not affect the other functions. And if there is a problem, you can easily pinpoint where it originates.
- ☞ N-tier architecture would involve dividing an application into three different tiers. These are as follows:
  1. Presentation tier
  2. Logic tier
  3. Data tier

1. Presentation tier

- ☞ The top most level of the application is the user interface. The main function of the interface is to translate tasks and results to something the user can understand.

2. Logic tier

- ☞ This layer co-ordinates the application, processes commands, makes logical decision and evaluations and performs calculations. It also moves and processes data between the two surrounding layers.

3. Data tier

- ☞ Here information is stored and retrieved from a database of file system. The information is then passed back to the logic tier for processing, and then eventually back to the user.

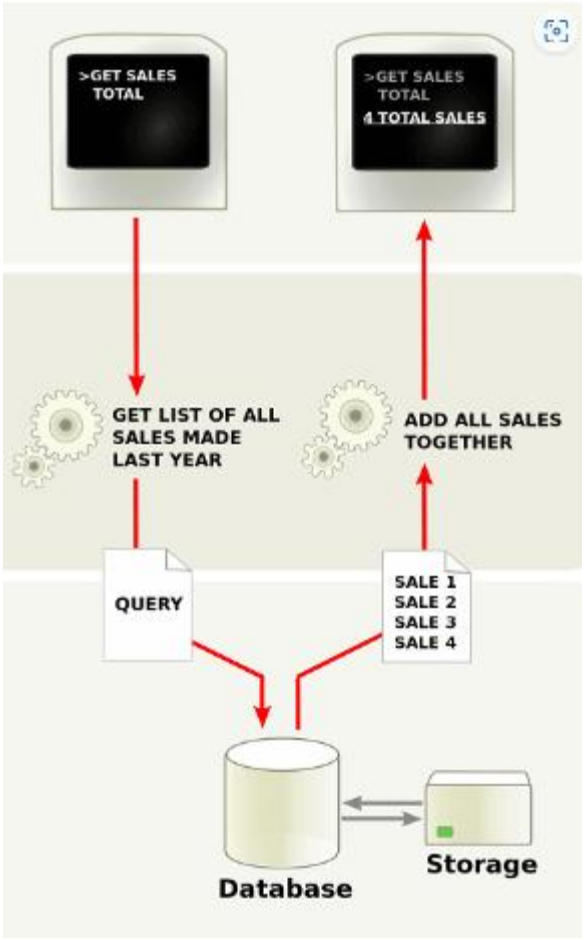


Fig: N-tier Architecture

What are the Benefits of N-Tier Architecture?

- ☞ There are several benefits to using n-tier architecture for your software. These are scalability, ease of management, flexibility, and security.

- ❖ **Secure:** You can secure each of the three tiers separately using different methods.
- ❖ **Easy to manage:** You can manage each tier separately, adding or modifying each tier without affecting the other tiers.
- ❖ **Scalable:** If you need to add more resources, you can do it per tier, without affecting the other tiers.
- ❖ **Flexible:** Apart from isolated scalability, you can also expand each tier in any manner that your requirements dictate.

- ☞ In short, with n-tier architecture, you can adopt new technologies and add more components without having to rewrite the entire application or redesigning your whole software, thus making it easier to scale or maintain. Meanwhile, in terms of security, you can store sensitive or

confidential information in the logic tier, keeping it away from the presentation tier, thus making it more secure.

Other benefits include:

- **More efficient development.**
  - N-tier architecture is very friendly for development, as different teams may work on each tier. This way, you can be sure the design and presentation professionals work on the presentation tier and the database experts work on the data tier.

- **Easy to add new features.**
  - If you want to introduce a new feature, you can add it to the appropriate tier without affecting the other tiers.
- **Easy to reuse.**
  - Because the application is divided into independent tiers, you can easily reuse each tier for other software projects. For instance, if you want to use the same program, but for a different data set, you can just replicate the logic and presentation tiers and then create a new data tier.

How It Works and Examples of N-Tier Architecture

- When it comes to n-tier architecture, a three-tier architecture is fairly common. In this setup, you have the presentation or GUI tier, the data layer, and the application logic tier.

- **The application logic tier.**
  The application logic tier is where all the "thinking" happens, and it knows what is allowed by your application and what is possible, and it makes other decisions. This logic tier is also the one that writes and reads data into the data tier.

- **The data tier.**
  The data tier is where all the data used in your application are stored. You can securely store data on this tier, do transaction, and even search through volumes and volumes of data in a matter of seconds.

- **The presentation tier.**
  The presentation tier is the user interface. This is what the software user sees and interacts with. This is where they enter the needed information. This tier also acts as a go-between for the data tier and the user, passing on the user's different actions to the logic tier.

Just imagine surfing on your favorite website. The presentation tier is the Web application that you see. It is shown on a Web browser you access from your computer, and it has the CSS, JavaScript, and HTML codes that allow you to make sense of the Web application. If you need to log in, the presentation tier will show you boxes for username, password, and the submit button. After filling out and then submitting the form, all that will be passed on to the logic tier. The logic tier will have the JSP, Java Servlets, Ruby, PHP and other programs. The logic tier would be run on a Web server. And in this example, the data tier would be some sort of database, such as a MySQL, NoSQL, or PostgreSQL database. All of these are run on a separate database server. Rich Internet applications and mobile apps also follow the same three-tier architecture.

And there are n-tier architecture models that have more than three tiers. Examples are applications that have these tiers:

Services – such as print, directory, or database services
Business domain – the tier that would host Java, DCOM, CORBA, and other application server object.
Presentation tier
Client tier – or the thin clients
One good instance is when you have an enterprise service-oriented architecture. The enterprise service bus or ESB would be there as a separate tier to facilitate the communication of the basic service tier and the business domain tier.