

Unit II: Working of Cloud Computing, Cloud Computing comparison with traditional computing architecture (client/server), Impact of Networks, Web Development and User Interface (UI) on Cloud computing.
Cloud Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.

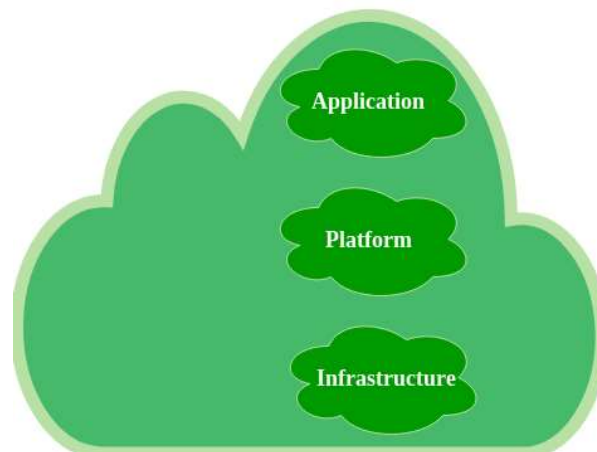
Working of Cloud Computing,

Cloud Computing Architecture: Cloud computing architecture refers to the components and sub-components required for cloud computing. These components typically refer to:

1. Front end(fat client, thin client)
2. Back-end platforms(servers, storage)
3. Cloud-based delivery and a network(Internet, Intranet, Intercloud).

Hosting a cloud: There are three layers in cloud computing. Companies use these layers based on the service they provide.

- Infrastructure
- Platform
- Application



Three layers of Cloud Computing

Benefits of Cloud Hosting:

1. **Scalability:** With Cloud hosting, it is easy to grow and shrink the number and size of servers based on the need. This is done by either increasing or decreasing the resources in the cloud. This ability to alter plans due to fluctuation in business size and needs is a superb benefit of cloud computing, especially when experiencing a sudden growth in demand.
2. **Instant:** Whatever you want is instantly available in the cloud.
3. **Save Money:** An advantage of cloud computing is the reduction in hardware costs. Instead of purchasing in-house equipment, hardware needs are left to the vendor. For companies that are growing rapidly, new hardware can be large, expensive, and inconvenient. Cloud computing alleviates these issues because resources can be acquired quickly and easily. Even better, the cost of repairing or replacing equipment is passed to the vendors. Along with purchase costs, off-site hardware cuts internal power costs and saves space. Large data centers can take up precious office space and produce a large amount of heat. Moving to cloud applications or storage can help maximize space and significantly cut energy expenditures.
4. **Reliability:** Rather than being hosted on one single instance of a physical server, hosting is delivered on a virtual partition that draws its resource, such as disk space, from an extensive network of underlying physical servers. If one server goes offline it will have no effect on availability, as the virtual servers will continue to pull resources from the remaining network of servers.
5. **Physical Security:** The underlying physical servers are still housed within data centers and so benefit from the security measures that those facilities implement to prevent people from accessing or disrupting them on-site.
6. **Outsource Management:** When you are managing the business, Someone else manages your computing infrastructure. You do not need to worry about management as well as upgradation.

To more clarification about how cloud computing has changed the commercial deployment of the system. Consider the below examples:

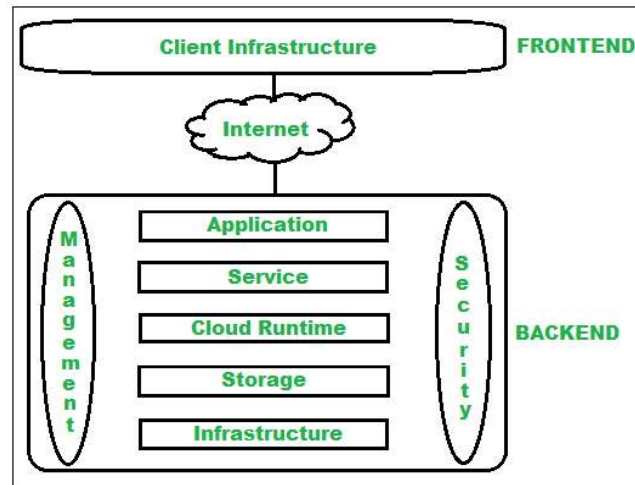
1. **Amazon Web Services(AWS):** One of the most successful cloud-based businesses is Amazon Web Services(AWS), which is an Infrastructure as a Service(IaaS) offering that pays rent for virtual computers on Amazon's infrastructure.
2. **Microsoft Azure Platform:** Microsoft is creating the Azure platform which enables the .NET Framework Application to run over the internet as an alternative platform for Microsoft developers. This is the classic Platform as a Service(PaaS).
3. **Google:** Google has built a worldwide network of data centers to service its search engine. From this service, Google has captured the world's advertising revenue. By using that revenue, Google offers free software to users based on infrastructure. This is called Software as a Service(SaaS).
4. **IBM Cloud** is a collection of cloud computing services for business provided by the IBM Corporation. It provides infrastructure as a service, software as a service, and platform as a service.
5. **Oracle Cloud** is a collection of cloud services offered by Oracle Corporation, including infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS).
6. **Alibaba Cloud** is the cloud computing arm of Alibaba Group, providing a comprehensive suite of global cloud computing services to power both their international customers' online businesses and Alibaba Group's own e-commerce ecosystem.
7. **Tencent Cloud** is a cloud service platform provided by Tencent. It provides a range of services such as virtual machines, storage, databases, and analytics.
8. **Rackspace** is a provider of hybrid cloud computing, founded in 1998. It provides managed hosting, cloud hosting, and email and apps services.
9. **Salesforce** – A cloud-based customer relationship management (CRM) platform used for sales, marketing, and customer service.
10. **VMware Cloud** – A cloud platform by VMware, offering services such as virtualization, cloud management, and network virtualization.
11. **DigitalOcean** – A cloud platform focused on providing easy-to-use, scalable compute services.
12. **Red Hat OpenShift** – A cloud platform by Red Hat, offering container-based application development and management.
13. **Cisco Cloud** – A cloud platform by Cisco, offering a range of services including networking, security, and application development.
14. **HP Helion** – A cloud platform by HP, offering services such as compute, storage, and networking.
15. **SAP Cloud Platform** – A cloud platform by SAP, offering services such as analytics, application development, and integration.
16. **Fujitsu Cloud** – A cloud platform by Fujitsu, offering services such as compute, storage, and networking.
17. **OVHcloud** – A cloud platform offering a range of services including compute, storage, and networking.
18. **CenturyLink Cloud** – A cloud platform offering a range of services including compute, storage, and networking.
19. **Joyent** – A cloud platform offering services such as compute, storage, and container-based application development.
20. **NTT Communications Cloud** – A cloud platform offering services such as compute, storage, and networking.

Cloud Computing Architecture :

The cloud architecture is divided into 2 parts i.e.

1. Frontend
2. Backend

The below figure represents an internal architectural view of cloud computing.



Architecture of Cloud Computing

Architecture of cloud computing is the combination of both SOA (Service Oriented Architecture) and EDA (Event Driven Architecture). Client infrastructure, application, service, runtime cloud, storage, infrastructure, management and security all these are the components of cloud computing architecture.

1. Frontend :

Frontend of the cloud architecture refers to the client side of cloud computing system. Means it contains all the user interfaces and applications which are used by the client to access the cloud computing services/resources. For example, use of a web browser to access the cloud platform.

- **Client Infrastructure** – Client Infrastructure is a part of the frontend component. It contains the applications and user interfaces which are required to access the cloud platform.
- In other words, it provides a GUI(Graphical User Interface) to interact with the cloud.

2. Backend :

Backend refers to the cloud itself which is used by the service provider. It contains the resources as well as manages the resources and provides security mechanisms. Along with this, it includes huge storage, virtual applications, virtual machines, traffic control mechanisms, deployment models, etc.

1. **Application –**
Application in backend refers to a software or platform to which client accesses. Means it provides the service in backend as per the client requirement.
2. **Service –**
Service in backend refers to the major three types of cloud based services like SaaS, PaaS and IaaS. Also manages which type of service the user accesses.
3. **Runtime Cloud-**
Runtime cloud in backend provides the execution and Runtime platform/environment to the Virtual machine.
4. **Storage –**
Storage in backend provides flexible and scalable storage service and management of stored data.
5. **Infrastructure –**
Cloud Infrastructure in backend refers to the hardware and software components of cloud like it includes servers, storage, network devices, virtualization software etc.
6. **Management –**
Management in backend refers to management of backend components like application, service, runtime cloud, storage, infrastructure, and other security mechanisms etc.

7. **Security** – Security in backend refers to implementation of different security mechanisms in the backend for secure cloud resources, systems, files, and infrastructure to end-users.
8. **Internet** – Internet connection acts as the medium or a bridge between frontend and backend and establishes the interaction and communication between frontend and backend.
9. **Database**– Database in backend refers to provide database for storing structured data, such as SQL and NOSQL databases. Example of Databases services include Amazon RDS, Microsoft Azure SQL database and Google CCloud SQL.
10. **Networking**– Networking in backend services that provide networking infrastructure for application in the cloud, such as load balancing, DNS and virtual private networks.
11. **Analytics**– Analytics in backend service that provides analytics capabilities for data in the cloud, such as warehousing, bussness intelligence and machine learning.

Benefits of Cloud Computing Architecture :

- Makes overall cloud computing system simpler.
- Improves data processing requirements.
- Helps in providing high security.
- Makes it more modularized.
- Results in better disaster recovery.
- Gives good user accessibility.
- Reduces IT operating costs.
- Provides high level reliability.
- Scalability.

Cloud Computing comparison with traditional computing architecture (client/server),

1. Cloud Computing :

Cloud Computing, as name suggests, is collective combination of configurable system resources and advanced service that can be delivered quickly using internet. It simply provides lower power expenses, no capital costs, no redundancy, lower employee costs, increased collaboration, etc. It makes us more efficient, more secure, and provide greater flexibility.

Advantages of Cloud Computing :

- **Scalability:** Cloud computing allows organizations to easily scale their computing resources up or down as their needs change, without having to purchase and manage additional hardware.
- **Cost Savings:** Using cloud computing can be more cost-effective than maintaining on-premises IT infrastructure, as it eliminates the need for costly hardware, software, and maintenance expenses.
- **Accessibility:** Cloud computing enables remote access to applications and data, allowing users to work from anywhere with an internet connection.
- **Reliability:** Cloud providers offer high levels of uptime and redundancy, ensuring that applications and data are available even in the event of hardware failure.
- **Flexibility:** Cloud computing offers a wide range of deployment options, including public, private, and hybrid clouds, which can be tailored to meet the unique needs of an organization.

Disadvantages of Cloud Computing :

- **Security:** Cloud computing involves sharing sensitive data with a third-party provider, which raises concerns about data security and privacy.
- **Dependence:** Organizations that rely on cloud providers for their computing infrastructure are vulnerable to service disruptions or data loss in the event of provider outages or other issues.
- **Internet Dependency:** Cloud computing requires a reliable and fast internet connection to access applications and data, which can be a challenge in some areas.
- **Technical Issues:** Technical issues with cloud services, such as compatibility problems or software bugs, can sometimes be difficult to resolve and can result in downtime or lost productivity.
- **Lack of Control:** With cloud computing, organizations have limited control over the infrastructure and services they use, which can make it difficult to customize or optimize the environment for their specific needs.

2. Traditional Computing :

Traditional Computing, as name suggests, is a possess of using physical data centers for storing digital assets and running complete networking system for daily operations. In this, access to data, or software, or storage by users is limited to device or official network they are connected with. In this computing, user can have access to data only on system in which data is stored.

Advantages of Traditional Computing :

- **Control:** With traditional computing, an organization has full control over the hardware and software it uses, allowing for customization and optimization of the computing environment.
- **Security:** Traditional computing offers a high level of data security, as sensitive data can be stored on-premises and protected by firewalls, encryption, and other security measures.
- **Reliability:** Traditional computing is not dependent on internet connectivity, making it less vulnerable to service disruptions or data loss.
- **Compatibility:** Traditional computing environments can be tailored to meet the specific needs of an organization, ensuring compatibility with existing software and systems.
- **Data Ownership:** With traditional computing, an organization owns and controls all of its data, reducing concerns about data privacy and regulatory compliance.

Disadvantages of Traditional Computing :

- **Cost:** Traditional computing can be more expensive than cloud computing, as it requires significant capital expenditures for hardware and software, as well as ongoing maintenance and support expenses.
- **Scalability:** Traditional computing can be difficult to scale up or down to meet changing needs, as it requires additional hardware or software to be added to the environment.
- **Accessibility:** Traditional computing may not allow for remote access to applications and data, limiting the ability of users to work from anywhere.
- **Maintenance:** Traditional computing environments require ongoing maintenance and upgrades to ensure security and performance, which can be time-consuming and expensive.
- **Limited Storage Capacity:** Traditional computing environments may have limited storage capacity, requiring organizations to periodically purchase additional hardware to accommodate growing data volumes.

Difference between Cloud Computing and Traditional Computing:

Cloud Computing	Traditional Computing
It refers to delivery of different services such as data and programs through internet on different servers.	It refers to delivery of different services on local server.
It takes place on third-party servers that is hosted by third-party hosting companies.	It takes place on physical hard drives and website servers.
It is ability to access data anywhere at any time by user.	User can access data only on system in which data is stored.
It is more cost effective as compared to tradition computing as operation and maintenance of server is shared among several parties that in turn reduce cost of public services.	It is less cost effective as compared to cloud computing because one has to buy expensive equipment's to operate and maintain server.
It is more user-friendly as compared to traditional computing because user can have access to data anytime anywhere using internet.	It is less user-friendly as compared to cloud computing because data cannot be accessed anywhere and if user has to access data in another system, then he need to save it in external storage medium.
It requires fast, reliable and stable internet connection to access information anywhere at any time.	It does not require any internet connection to access data or information.

Cloud Computing	Traditional Computing
It provides more storage space and servers as well as more computing power so that applications and software run must faster and effectively.	It provides less storage as compared to cloud computing.
It also provides scalability and elasticity i.e., one can increase or decrease storage capacity, server resources, etc., according to business needs.	It does not provide any scalability and elasticity.
Cloud service is served by provider's support team.	It requires own team to maintain and monitor system that will need a lot of time and efforts.
Software is offered as an on-demand service (SaaS) that can be accessed through subscription service.	Software is purchased individually for every user and requires to be updated periodically.

Impact of Networks,

Cloud Networking is service or science in which company's networking procedure is hosted on public or private cloud. Cloud Computing is source manage in which more than one computing resources share identical platform and customers are additionally enabled to get entry to these resources to specific extent. Cloud networking in similar fashion shares networking however it gives greater superior features and network features in cloud with interconnected servers set up under cyberspace.

Why cloud networking is required and in-demand?

- It is in demand by many companies for their speedy and impervious delivery, fast processing, dependable transmission of information without any loss, pocket-friendly set-up. Benefited corporations who select Cloud Networking consist of internet service providers, e-commerce, cloud service providers, community operators, cloud service providers.
- It permits users to boost their networks in accordance with necessities in cloud-based services. An actual cloud network provides high-end monitoring to globally positioned servers, controls site visitors flow between interconnected servers, protects structures with superior network safety, and offers visibility to user by means of its centralized management. The web access can be expanded and made greater reliable bandwidth to promote couple of network features into cloud.
- It ensures overall performance and safety in multi-cloud surrounding so that Information technology receives greater visibility by means of supplying end-users with necessities and experience they need. Workloads are shared between cloud surroundings using software program as provider application. Safety is given to user to get entry to web page and infrastructure by means of transferring functions to the cloud with standard security model. The gateway offers contextual access code and multi-layer firewall. Applications and offerings are given to allotted data centers in cloud environment.
- Software-Defined Wide Area Network is technology that makes use of bunch of networking switches and routers to virtually get entry to machine from hardware to software program deployed on white box. Confidential units and information are set up on primary branch workplace or consumer region and given unique access to administrator to get admission to its superior networking functions, cloud optimization software, and firewalls. It is massive range of array with network features deployed in cloud platform.
- Software-defined Wide range community offers standard load balancing approach and combines all stages of network to user experience. It offers greater visuality with assist of intelligent analytics. Giving options to every cloud user may be challenging however leverage of all offerings and supplying them special answer by means of SD-WAN from ceasing to cease applications.

Advantages of Cloud Networking :

1. **On-Demand Self Service** – Cloud computing provides required application, services, and utility to client. With login key, they can begin to use besides any human interplay and cloud service providers. It consists of storage and digital machines.
2. **High Scalability** – It requests grant of resources on large scale besides any human intervention with every service provider.
3. **Agility** – It shares the assets efficiently amongst customers and works quickly.
4. **Multi-sharing** – By distributed computing, distinctive clients from couple of areas share identical resources through fundamental infrastructure.
5. **Low Cost** – It is very economical and can pay in accordance with its usage.
6. **Services in pay per use Model** – Application Programming Interface is given to clients to use resources and offerings and pay on service basis.
7. **High availability and Reliability** – The servers are accessible at the proper time besides any delay or disappointment.
8. **Maintenance** – It is user-friendly as they are convenient to get entry to from their location and does not require any installation set up.

Disadvantages of Cloud Networking :

1. **Dependency on internet connectivity** – Cloud networking requires a strong and reliable internet connection. If the connection is slow or unreliable, it can cause performance issues and disrupt network access.
2. **Security concerns** – Cloud networks are susceptible to cyber-attacks, and security breaches can compromise the sensitive data stored on the cloud. This risk is mitigated through proper security measures, but there is always some level of vulnerability.
3. **Limited control** – When you use a cloud network, you are dependent on the cloud provider to manage and maintain the network infrastructure. This can limit your control over the network and how it is managed.
4. **Cost** – Cloud networking can be expensive, particularly for large-scale enterprise networks. The costs can add up quickly, especially when you factor in the ongoing maintenance and support costs.
5. **Lack of customization** – Cloud networking solutions are typically pre-configured and may not offer the level of customization that some organizations require. This can limit your ability to tailor the network to your specific needs.

Web Development and User Interface (UI) on Cloud computing.

Web development refers to the creating, building, and maintaining of websites. It includes aspects such as web design, web publishing, web programming, and database management. It is the creation of an application that works over the internet i.e. websites.

Web Development

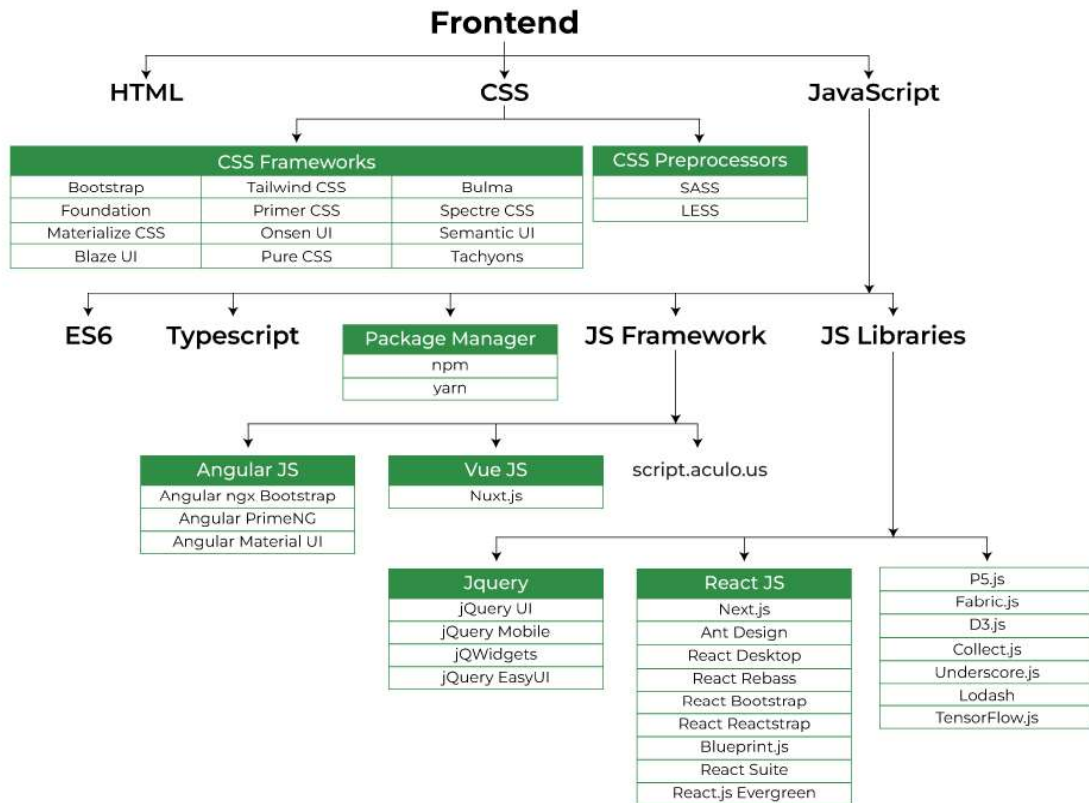
The word Web Development is made up of two words, that is:

- **Web:** It refers to websites, web pages or anything that works over the internet.
- **Development:** It refers to building the application from scratch.

Web Development can be classified into two ways:

- Frontend Development
- Backend Development

Frontend Development: The part of a website where the user interacts directly is termed as front end. It is also referred to as the ‘client side’ of the application.



Frontend Development Roadmap

Popular Frontend Technologies

- **HTML:** HTML stands for HyperText Markup Language. It is used to design the front end portion of web pages using markup language. It acts as a skeleton for a website since it is used to make the structure of a website.
- **CSS:** Cascading Style Sheets fondly referred to as CSS is a simply designed language intended to simplify the process of making web pages presentable. It is used to style our website.
- **JavaScript:** JavaScript is a scripting language used to provide a dynamic behavior to our website.
- **Bootstrap:** Bootstrap is a free and open-source tool collection for creating responsive websites and web applications. It is the most popular CSS framework for developing responsive, mobile-first websites. Nowadays, the websites are perfect for all browsers (IE, Firefox, and Chrome) and for all sizes of screens (Desktop, Tablets, Phablets, and Phones).
 - Bootstrap 4
 - Bootstrap 5

Frontend Libraries and Frameworks

HTML

CSS

- **CSS Frameworks**
 - Bootstrap
 - Tailwind CSS
 - Bulma

- Foundation
- Primer CSS
- Spectre CSS
- Materialize CSS
- Onsen UI
- Semantic UI
- Blaze UI
- Pure CSS
- **CSS Preprocessors**
 - SASS
 - LESS

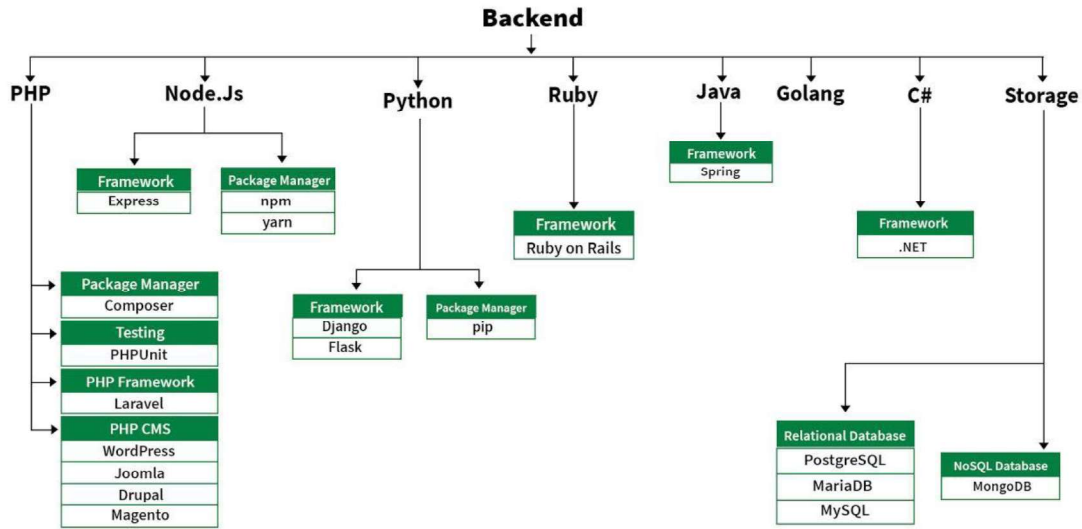
JavaScript

- **JavaScript Technology**
 - ES6
 - TypeScript
- **JavaScript Frameworks**
 - AngularJS
 - Angular ngx Bootstrap
 - Angular PrimeNG
 - VueJS
 - NuxtJS
 - script.aculo.us
 - Ember.js
 - Handlebar.js
 - Backbone.js
- **JavaScript Libraries**
 - jQuery
 - jQuery UI
 - jQuery Mobile
 - jQWidgets
 - jQuery EasyUI
 - ReactJS
 - NextJS
 - Ant Design
 - React Desktop
 - React Rebass
 - React Bootstrap
 - React Reactstrap
 - BlueprintJS
 - React Suite
 - React.js Evergreen
 - React Material UI
 - P5.js
 - Fabric.js
 - D3.js
 - Collect.js
 - Underscore.js
 - Lodash
 - TensorFlow.js

Backend Development

Backend is the server side of a website. It is part of the website that users cannot see and interact with. It is the portion of software that does not come in direct contact with the users. It is used to store and arrange data.

Backend Roadmap



Backend Development Roadmap

Popular Backend Technologies

- **PHP:** PHP is a server-side scripting language designed specifically for web development.
- **Java:** Java is one of the most popular and widely used programming languages. It is highly scalable.
- **Python:** Python is a programming language that lets you work quickly and integrate systems more efficiently.
- **Node.js:** Node.js is an open source and cross-platform runtime environment for executing JavaScript code outside a browser.

Back End Frameworks and Technology:

PHP

- **Framework:** Laravel
- **CMS:** WordPress

NodeJS

- **Framework:** Express

Python

- **Framework:** Django
- **Package Manager:** Python PIP

Ruby

- **Framework:** Ruby on Rails

Java

- **Framework:** Spring, Hibernate

C#

- **Framework:** .NET

Database:

- **Relation Database**
 - PostgreSQL
 - MariaDB
 - MySQL
- **NoSql Database**
 - MongoDB

Web Development Tutorials

- HTML

- CSS
- JavaScript
- jQuery
- Bootstrap
- React JS
- AngularJS
- PHP
- Node.js

User Interface (UI) defines the way humans interact with the information systems. In Layman's term, User Interface (UI) is a series of pages, screens, buttons, forms and other visual elements that are used to interact with the device. Every app and every website has a user interface.

User Interface (UI) Design is the creation of graphics, illustrations, and use of photographic artwork and typography to enhance the display and layout of a digital product within its various device views. Interface elements consist of input controls (buttons, drop-down menus, data fields), navigational components (search fields, slider, icons, tags), informational components (progress bars, notifications, message boxes).

Types of User Interface (UI):

- GUI (Graphical User Interface)
- Command line interface
- Menu Driven Interface
- Form Based Interface
- Natural Language Interface

Significance of User Interface (UI):

A good User Interface (UI) focuses on making user's interactions simple and efficient. User would appreciate a website with intuitive user interface that leads them towards their task in most engaging way. User Interface (UI) design focuses on thinking of a user, what they might need to do when they visit website and ensure that the interface has elements that are easy to access and understand. Being a UI designer, one need to understand the goals, skills, preferences and tendencies of the user to make a better interface.

Why is User Interface (UI) important?

- **How you present your product matters the most.**
The presentation (**the interface**) of a badly designed application or website can drive away the incoming users and leave a bad impression on them. Navigation through a site can be made efficient and simple by effective UI design.
- **Great design is great business**
The color scheme, layout, graphics, tab and button placement, typography usage and other design elements determine how well the site/app communicates visually with the user.
- **At a given time, finding right thing at right place is essential**
Consistent navigation that is equally easy to locate and browse through is basic need of any app/website. If navigation is complex for a user to work, there is no way he would want to work on that site/app.

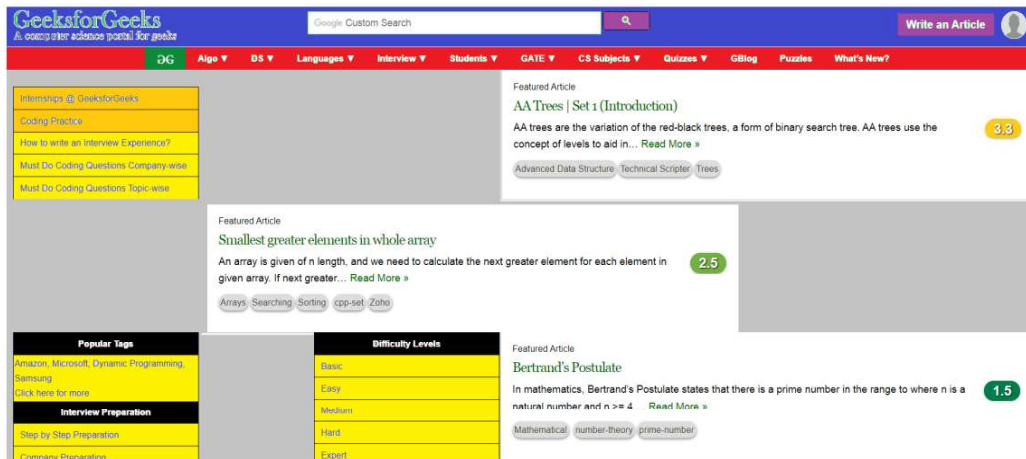
Advantages of User Interface (UI):

- No need to learn complex commands/languages for working with UI.
- Easiness for non-technical people. A beginner can navigate through a site with ease if its simple and well informative.
- Usage of blocks and typography makes user experience better.
- Easy setup and ready to start working are awesome. Hiding the complexity of actions from the user and display only the required information is key to good interface.

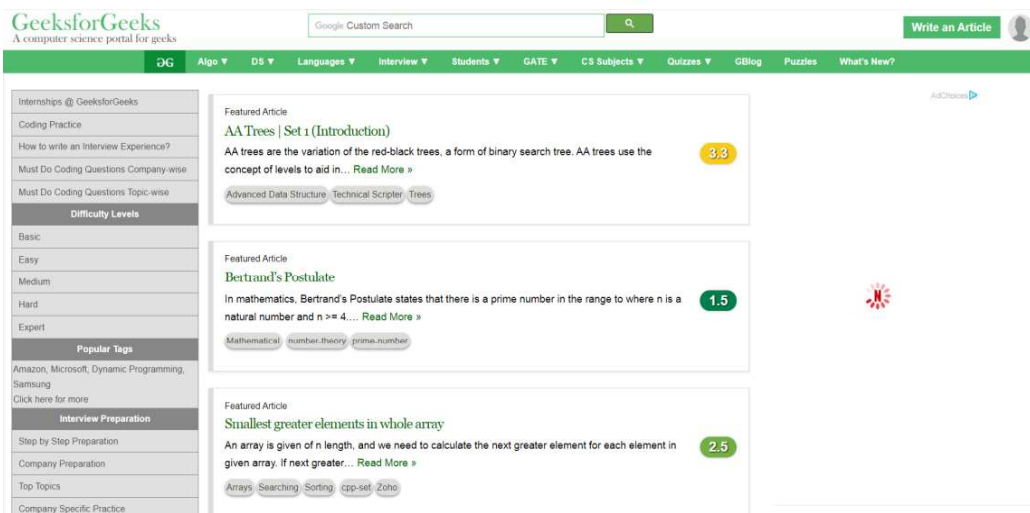
Disadvantages of UI :

- When not properly built, it can be very difficult to work with.
- Takes time to built a Perfect UI.

Example: It shows a Bad UI design and a Good UI design. See the differences and try to understand how important it is to have a good UI design.



BAD UI



GOOD UI



As the User Interface can make or break the incoming users, it's important to take care of below points when designing a UI:

- **Keep the interface simple:** Clear and simple interface are best. Avoid unnecessary elements. Best interfaces are invisible to user.
- **Be consistent and use common UI elements:** Using common elements, users feel more comfortable and are able to get things done more quickly. Create pattern to facilitate efficiency.
- **Placement of items:** To draw attention to most important pieces of information careful placement of items is necessary. This can improve users readability and engage them.
- **Use of right color:** To direct attention towards something take advantage of color, light, shade, contrast and texture. It's important to make use of good color combination as a bad color combination can easily distract or irritate a user.
- **Anticipate:** Make the user to work less by having pre-chosen fields, reduce the burden on the user, anticipate the goals of the users who come to your site. The things which can be mostly searched by the users are presented so that the users need not to work to search for it.

Cloud Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.

What is a Cloud Deployment Model?

Cloud Deployment Model functions as a virtual computing environment with a deployment architecture that varies depending on the amount of data you want to store and who has access to the infrastructure.

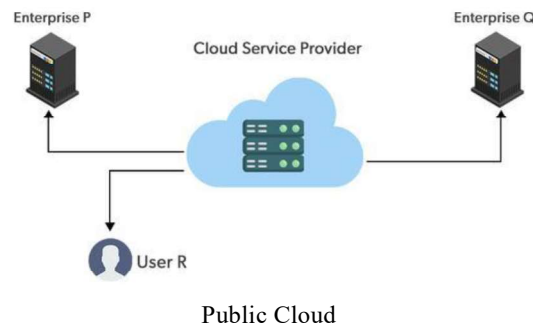
Types of Cloud Computing Deployment Models

The cloud deployment model identifies the specific type of cloud environment based on ownership, scale, and access, as well as the cloud's nature and purpose. The location of the servers you're utilizing and who controls them are defined by a cloud deployment model. It specifies how your cloud infrastructure will look, what you can change, and whether you will be given services or will have to create everything yourself. Relationships between the infrastructure and your users are also defined by cloud deployment types. Different types of cloud computing deployment models are described below.

- Public Cloud
- Private Cloud
- Hybrid Cloud
- Community Cloud
- Multi-Cloud

Public Cloud

The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open to everyone. The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups. The infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by the consumer. It is a type of cloud hosting that allows customers and users to easily access systems and services. This form of cloud computing is an excellent example of cloud hosting, in which service providers supply services to a variety of customers. In this arrangement, storage backup and retrieval services are given for free, as a subscription, or on a per-user basis. For example, Google App Engine etc.



Advantages of the Public Cloud Model

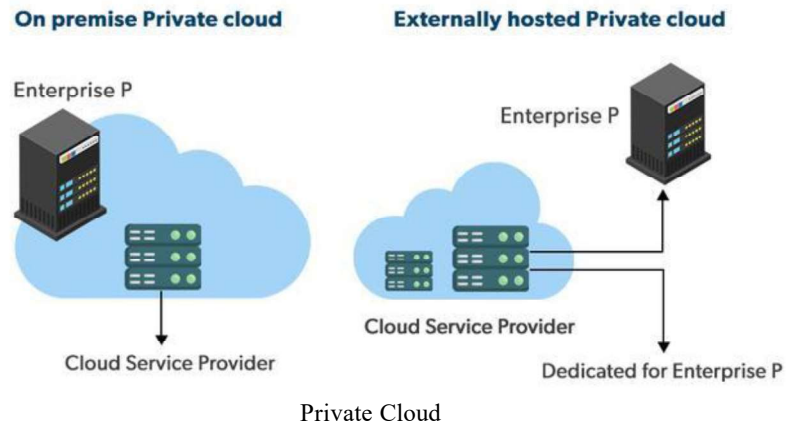
- **Minimal Investment:** Because it is a pay-per-use service, there is no substantial upfront fee, making it excellent for enterprises that require immediate access to resources.
- **No setup cost:** The entire infrastructure is fully subsidized by the cloud service providers, thus there is no need to set up any hardware.
- **Infrastructure Management is not required:** Using the public cloud does not necessitate infrastructure management.
- **No maintenance:** The maintenance work is done by the service provider (not users).
- **Dynamic Scalability:** To fulfill your company's needs, on-demand resources are accessible.

Disadvantages of the Public Cloud Model

- **Less secure:** Public cloud is less secure as resources are public so there is no guarantee of high-level security.
- **Low customization:** It is accessed by many public so it can't be customized according to personal requirements.

Private Cloud

The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer). There is no need to share your hardware with anyone else. The distinction between private and public clouds is in how you handle all of the hardware. It is also called the "internal cloud" & it refers to the ability to access systems and services within a given border or organization. The cloud platform is implemented in a cloud-based secure environment that is protected by powerful firewalls and under the supervision of an organization's IT department. The private cloud gives greater flexibility of control over cloud resources.



Advantages of the Private Cloud Model

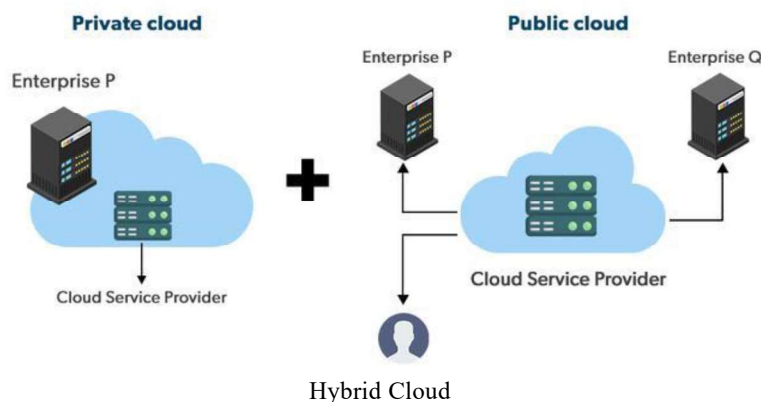
- **Better Control:** You are the sole owner of the property. You gain complete command over service integration, IT operations, policies, and user behavior.
- **Data Security and Privacy:** It's suitable for storing corporate information to which only authorized staff have access. By segmenting resources within the same infrastructure, improved access and security can be achieved.
- **Supports Legacy Systems:** This approach is designed to work with legacy systems that are unable to access the public cloud.
- **Customization:** Unlike a public cloud deployment, a private cloud allows a company to tailor its solution to meet its specific needs.

Disadvantages of the Private Cloud Model

- **Less scalable:** Private clouds are scaled within a certain range as there is less number of clients.
- **Costly:** Private clouds are more costly as they provide personalized facilities.

Hybrid Cloud

By bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds. With a hybrid solution, you may host the app in a safe environment while taking advantage of the public cloud's cost savings. Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.



Advantages of the Hybrid Cloud Model

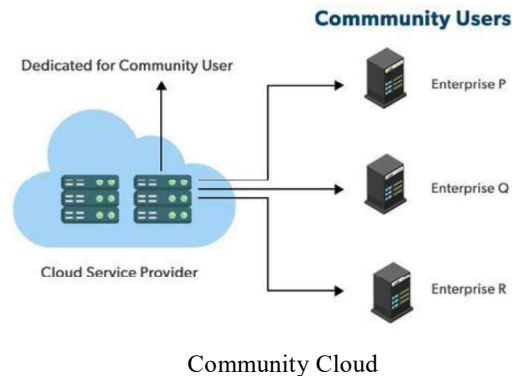
- **Flexibility and control:** Businesses with more flexibility can design personalized solutions that meet their particular needs.
- **Cost:** Because public clouds provide scalability, you'll only be responsible for paying for the extra capacity if you require it.
- **Security:** Because data is properly separated, the chances of data theft by attackers are considerably reduced.

Disadvantages of the Hybrid Cloud Model

- **Difficult to manage:** Hybrid clouds are difficult to manage as it is a combination of both public and private cloud. So, it is complex.
- **Slow data transmission:** Data transmission in the hybrid cloud takes place through the public cloud so latency occurs.

Community Cloud

It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific needs of a community, industry, or business. The infrastructure of the community could be shared between the organization which has shared concerns or tasks. It is generally managed by a third party or by the combination of one or more organizations in the community.



Advantages of the Community Cloud Model

- **Cost Effective:** It is cost-effective because the cloud is shared by multiple organizations or communities.
- **Security:** Community cloud provides better security.
- **Shared resources:** It allows you to share resources, infrastructure, etc. with multiple organizations.
- **Collaboration and data sharing:** It is suitable for both collaboration and data sharing.

Disadvantages of the Community Cloud Model

- **Limited Scalability:** Community cloud is relatively less scalable as many organizations share the same resources according to their collaborative interests.
- **Rigid in customization:** As the data and resources are shared among different organizations according to their mutual interests if an organization wants some changes according to their needs they cannot do so because it will have an impact on other organizations.

Multi-Cloud

We're talking about employing multiple cloud providers at the same time under this paradigm, as the name implies. It's similar to the hybrid cloud deployment approach, which combines public and private cloud resources. Instead of merging private and public clouds, multi-cloud uses many public clouds. Although public cloud providers provide numerous tools to improve the reliability of their services, mishaps still occur. It's quite rare that two distinct clouds would have an incident at the same moment. As a result, multi-cloud deployment improves the high availability of your services even more.

Advantages of the Multi-Cloud Model

- You can mix and match the best features of each cloud provider's services to suit the demands of your apps, workloads, and business by choosing different cloud providers.
- **Reduced Latency:** To reduce latency and improve user experience, you can choose cloud regions and zones that are close to your clients.
- **High availability of service:** It's quite rare that two distinct clouds would have an incident at the same moment. So, the multi-cloud deployment improves the high availability of your services.

Disadvantages of the Multi-Cloud Model

- **Complex:** The combination of many clouds makes the system complex and bottlenecks may occur.
- **Security issue:** Due to the complex structure, there may be loopholes to which a hacker can take advantage hence, makes the data insecure.

What is the Right Choice for Cloud Deployment Model?

As of now, no such approach fits picking a cloud deployment model. We will always consider the best cloud deployment model as per our requirements. Here are some factors which should be considered before choosing the best deployment model.

- **Cost:** Cost is an important factor for the cloud deployment model as it tells how much amount you want to pay for these things.
- **Scalability:** Scalability tells about the current activity status and how much we can scale it.
- **Easy to use:** It tells how much your resources are trained and how easily can you manage these models.
- **Compliance:** Compliance tells about the laws and regulations which impact the implementation of the model.
- **Privacy:** Privacy tells about what data you gather for the model.

Each model has some advantages and some disadvantages, and the selection of the best is only done on the basis of your requirement. If your requirement changes, you can switch to any other model.

Overall Analysis of Cloud Deployment Models

The overall Analysis of these models with respect to different factors is described below.

Factors	Public Cloud	Private Cloud	Community Cloud	Hybrid Cloud
Initial Setup	Easy	Complex, requires a professional team to setup	Complex, requires a professional team to setup	Complex, requires a professional team to setup
Scalability and Flexibility	High	High	Fixed	High
Cost-Comparison	Cost-Effective	Costly	Distributed cost among members	Between public and private cloud
Reliability	Low	Low	High	High
Data Security	Low	High	High	High
Data Privacy	Low	High	High	High

Models of Cloud Computing

Cloud Computing helps in rendering several services according to roles, companies, etc. Cloud computing models are explained below.

- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Software as a service (SaaS)

1. Infrastructure as a service (IaaS)

Infrastructure as a Service (IaaS) helps in delivering computer infrastructure on an external basis for supporting operations. Generally, IaaS provides services to networking equipment, devices, databases, and web servers. Infrastructure as a Service (IaaS) helps large organizations, and large enterprises in managing and building their IT platforms. This infrastructure is flexible according to the needs of the client.

Advantages of IaaS

- IaaS is cost-effective as it eliminates capital expenses.
- IaaS cloud provider provides better security than any other software.
- IaaS provides remote access.

Disadvantages of IaaS

- In IaaS, users have to secure their own data and applications.
- Cloud computing is not accessible in some regions of the World.

2. Platform as a service (PaaS)

Platform as a Service (PaaS) is a type of cloud computing that helps developers to build applications and services over the Internet by providing them with a platform.

PaaS helps in maintaining control over their business applications.

Advantages of PaaS

- PaaS is simple and very much convenient for the user as it can be accessed via a web browser.
- PaaS has the capabilities to efficiently manage the lifecycle.

Disadvantages of PaaS

- PaaS has limited control over infrastructure as they have less control over the environment and are not able to make some customizations.
- PaaS has a high dependence on the provider.

3. Software as a service (SaaS)

Software as a Service (SaaS) is a type of cloud computing model that is the work of delivering services and applications over the Internet. The SaaS applications are called Web-Based Software or Hosted Software.

SaaS has around 60 percent of cloud solutions and due to this, it is mostly preferred by companies.

Advantages of SaaS

- SaaS can access app data from anywhere on the Internet.
- SaaS provides easy access to features and services.

Disadvantages of SaaS

- SaaS solutions have limited customization, which means they have some restrictions within the platform.
- SaaS has little control over the data of the user.
- SaaS are generally cloud-based, they require a stable internet connection for proper working.

For more, you can refer to Cloud-Based Services.

FAQs:

1. List the disadvantages of the public cloud model?

Answer:

The disadvantages of the public cloud model are:

- **Data Security and Privacy Concerns:** Because it is open to the public, it does not provide complete protection against cyber-attacks and may expose weaknesses.
- **Issues with Reliability:** Because the same server network is accessible to a wide range of users, it is susceptible to failure and outages.
- **Limitation on Service/License:** While there are numerous resources that you may share with renters, there is a limit on how much you can use.

2. List the disadvantages of the hybrid cloud model?

Answer:

The disadvantages of the hybrid cloud model are:

- **Maintenance:** A hybrid cloud computing strategy may necessitate additional maintenance, resulting in a greater operational expense for your company.
- **Difficult Integration:** When constructing a hybrid cloud, data, and application integration might be difficult. It's also true that combining two or more infrastructures will offset a significant upfront cost.

3. List the disadvantages of the private cloud model?

Answer:

The disadvantages of the private cloud model are

- **Restricted Scalability:** Private clouds have restricted scalability because they are scaled within the confines of internally hosted resources. The choice of underlying hardware has an impact on scalability.
- **Higher Cost:** Due to the benefits you would receive, your investment will be higher than the public cloud (pay for software, hardware, staffing, etc).

4. What is utility computing?

Answer:

Utility computing is a service-providing paradigm in which a service provider makes computing resources and infrastructure management available to customers as needed, charging them on a per-use basis rather than a set fee.

The user can only pay for what they use using utility computing. It is a plug-in that is administered by an organization that determines what kind of cloud services must be deployed. The majority of businesses prefer a hybrid strategy.

5. How to secure data while transferring?

Answer:

To keep your data safe while being transported from one location to another, be sure the encryption key used with the data you're transferring isn't leaking.

How to Publish a Website on Netlify

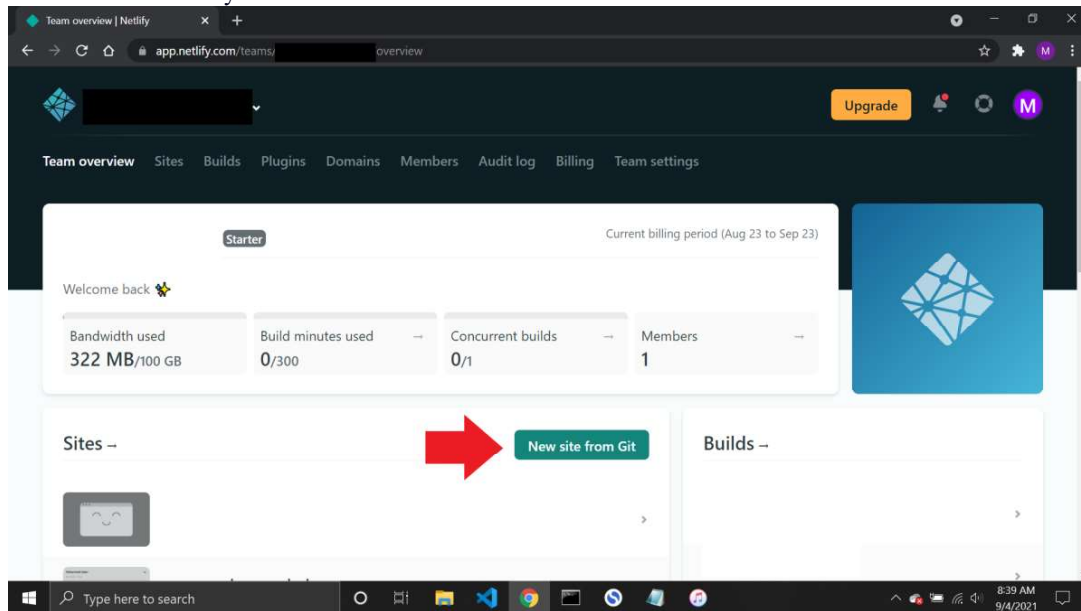
The first method we're going to explore is how to publish your website on Netlify.

Netlify is a platform for hosting websites. It is easy to host sites on Netlify as you don't need to configure it manually – and best of all, it's free. If you haven't signed up for an account, now is a good time to do so.

Here's the step-by-step process of publishing your website on Netlify:

Step 1: Add your new site

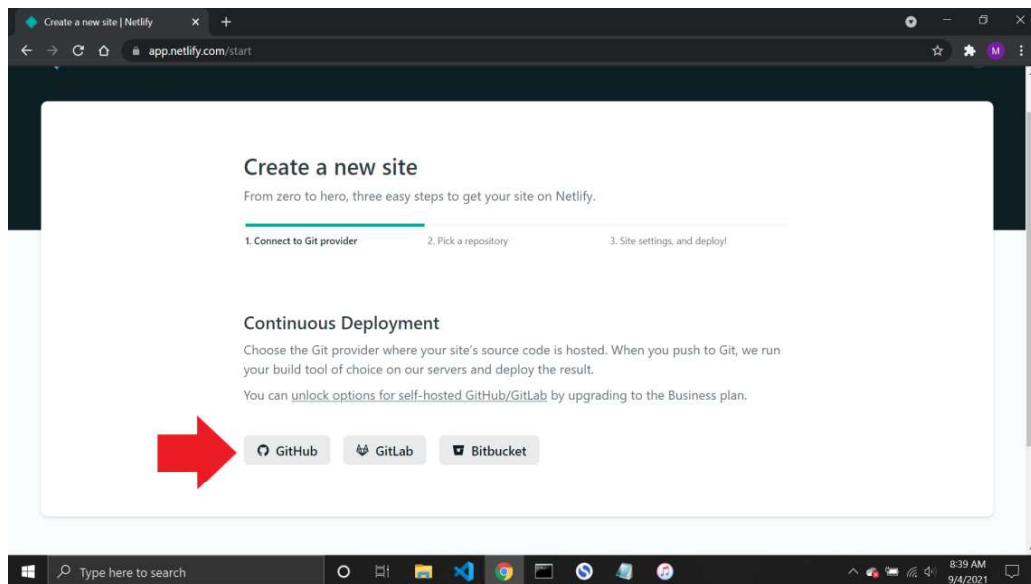
Once you've logged in, it will take you to a home dashboard. Click the **New site from git** button to add your new website to Netlify.



Step 2: Link to your GitHub

When you click the **New site from git** button, it will take you to the "Create a new site" page. Make sure that you push your repository on GitHub so that Netlify can link to your GitHub account.

Click the **GitHub** button as shown in the screenshot below:

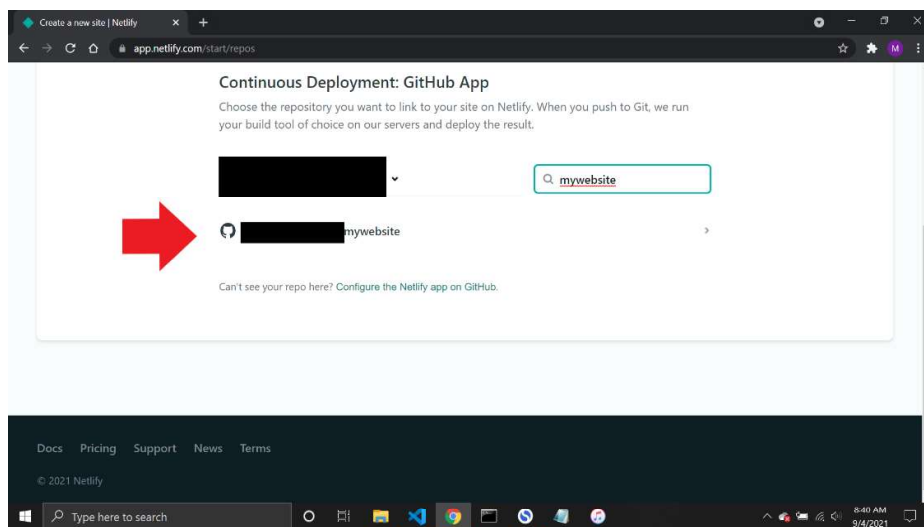


Step 3: Authorize Netlify

Next, click the **Authorize Netlify by Netlify** button. This permission is needed so that both Netlify and GitHub can connect.

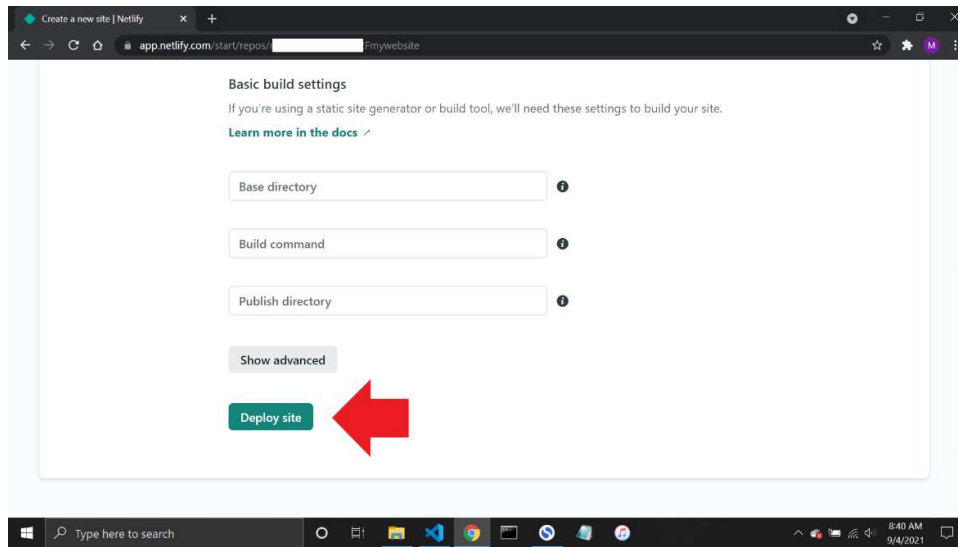
Step 4: Select your repository

Once you grant permission to Netlify, you can see a list of all your repositories. Select your website to publish. You can find it by either scrolling down the list or using the search bar to narrow down the list.



Step 5: Configure your settings

After selecting your website, you will be prompted to configure the settings for deploying the website. Since your website is simply a static one, there's not much to do here. Just click **Deploy site** to continue.

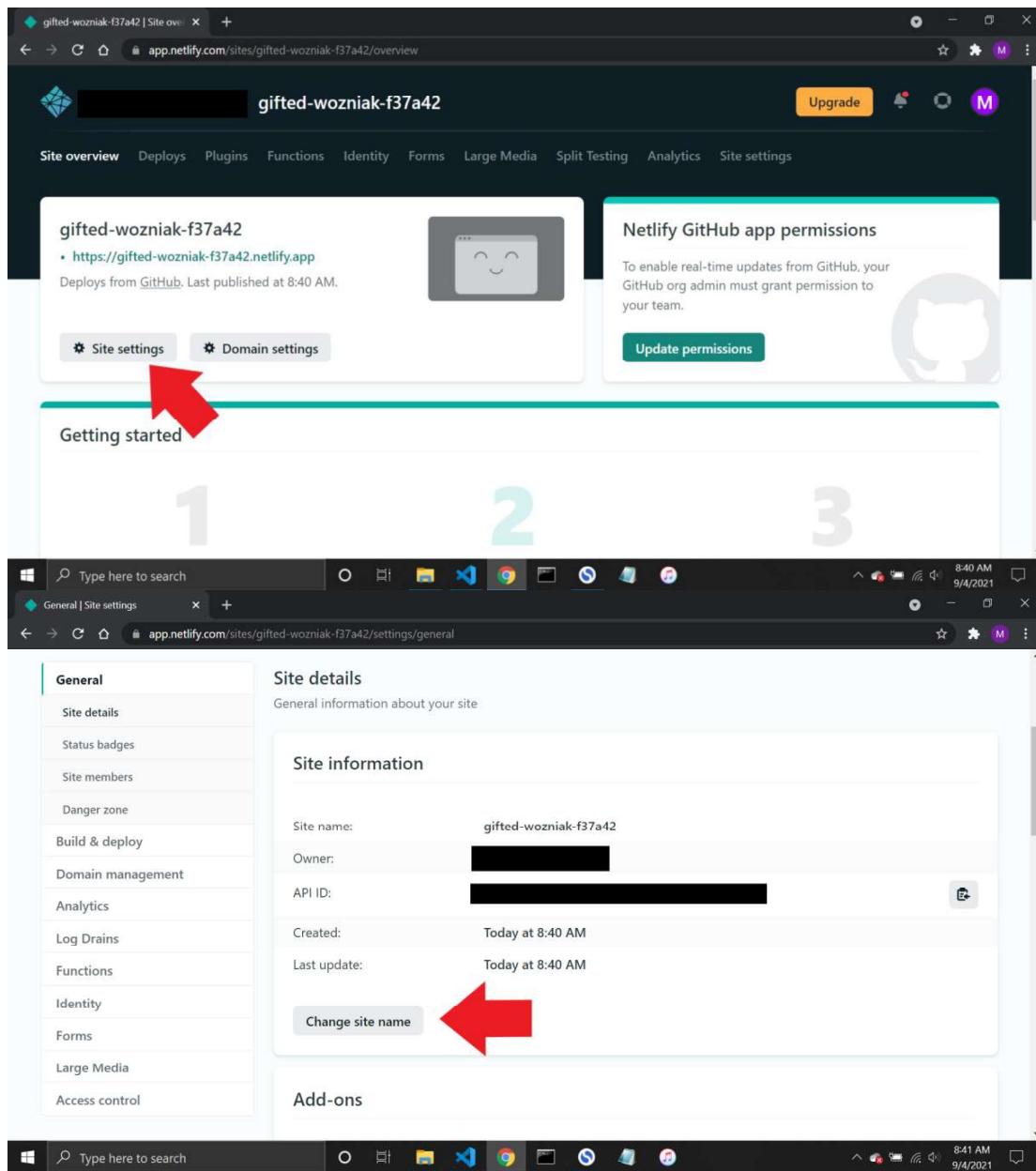


Step 6: Publish your website

Your website is now ready to publish! Netlify will do the rest of the work for you, and it will only take a minute or so to complete the process.

Now you are done! Your new website is published, and you can view it by clicking the green link.

Right now, your URL looks random, but you can edit it by clicking the **Site settings** button and then the **Change site name** button.



Congratulation on publishing your first new website! Now we'll learn how to publish a website with GitHub.

How to Publish a Website on GitHub

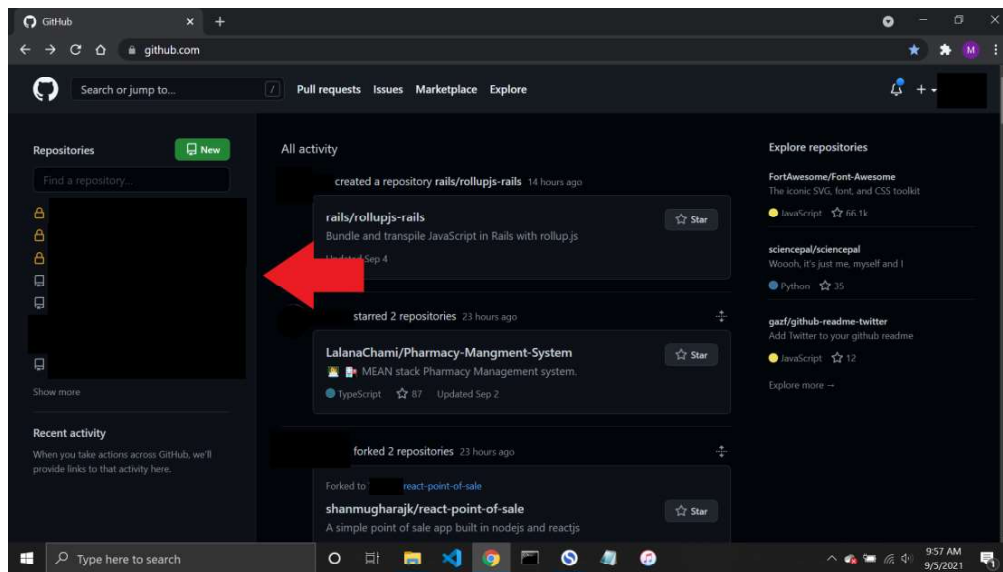
The second method we'll look at uses GitHub to publish your site. GitHub is a platform for storing, tracking, and managing project source code. It is also where you can publish your HTML website – and like Netlify, it is free to host here.

Here's the step-by-step process of publishing your website on GitHub:

Note: You can only publish your website on GitHub if you set the repository's visibility to public. If you want to deploy a website while it is private, upgrade your account to Pro or use Netlify to host there instead.

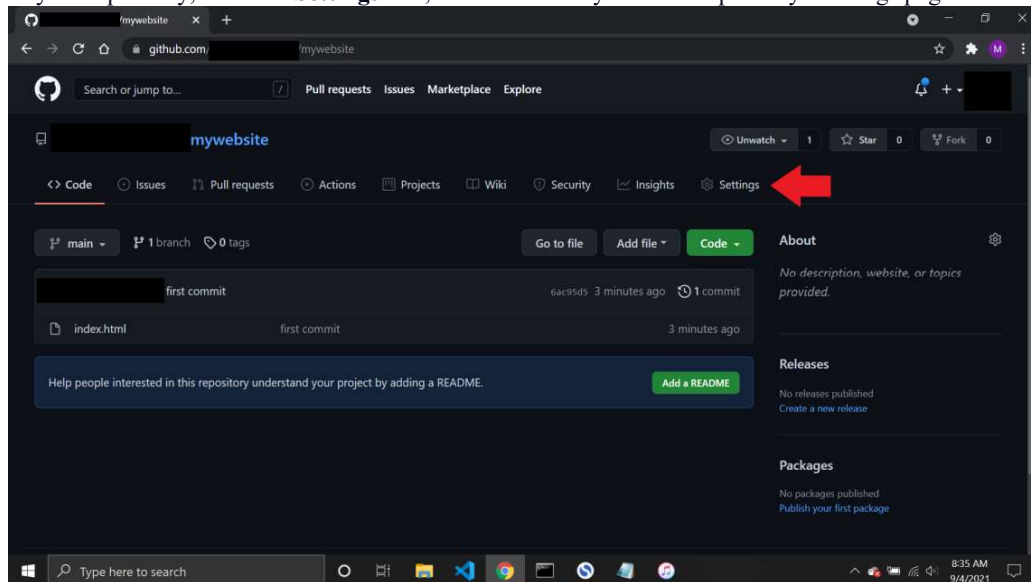
Step 1: Go to your website's repository

After you've logged in, go to the repository on the left sidebar and select the one you want to publish.



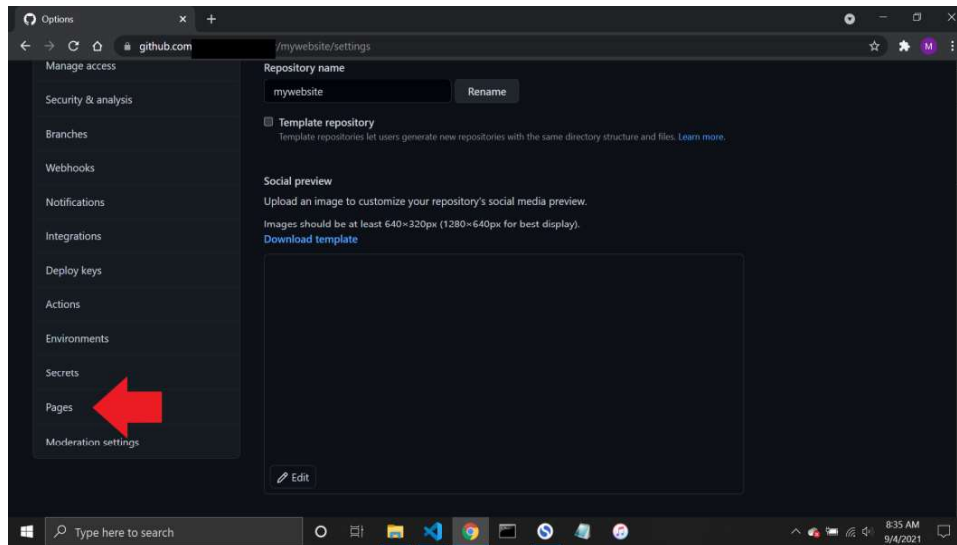
Step 2: Select the settings

In your repository, click the **Settings** link, and it will take you to the repository's settings page.



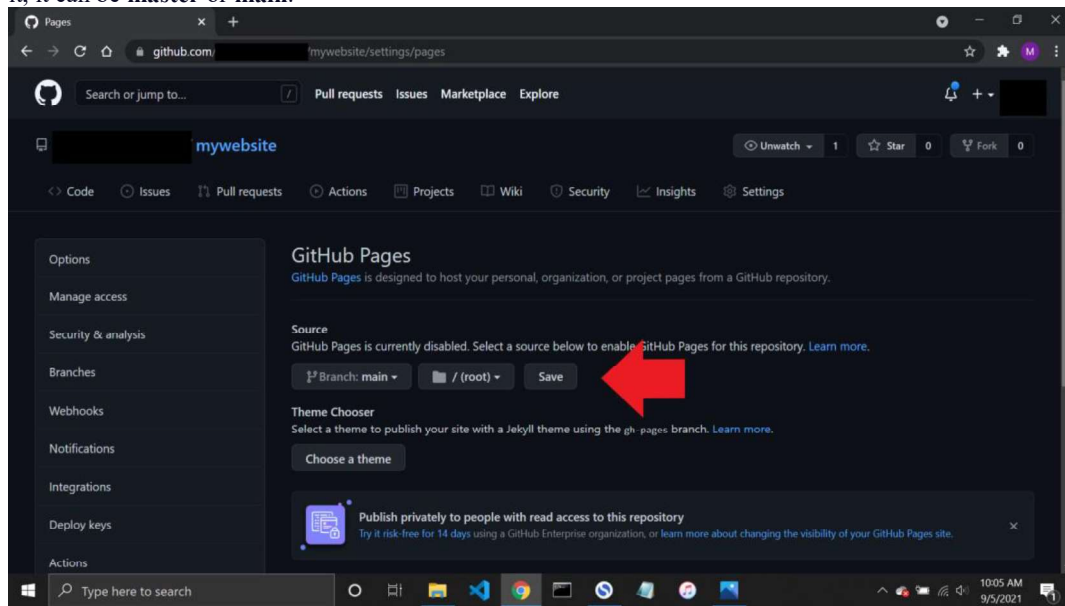
Step 3: Go to GitHub Pages

When you're in a repository's settings, scroll down a bit until you see the **Pages** link on the left sidebar. Click it, and it will lead you to GitHub Pages.



Step 4: Select the branch

In the source section, click the dropdown and select the master branch and save it. Depending on how you name it, it can be **master** or **main**.



Step 5: All done

And you are done! Your website will be published, and it will take only a minute or so to complete the process. Refresh the page, and you will see a link to your newly published website.