

Networks basics

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What is a Computer Network?

- Computer Network is a group of computers connected with each other through wires, optical fibres or optical links so that various devices can interact with each other through a network.
- The aim of the computer network is the sharing of resources among various devices.
- In the case of computer network technology, there are several types of networks that vary from simple to complex level.

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What is Computer Network?

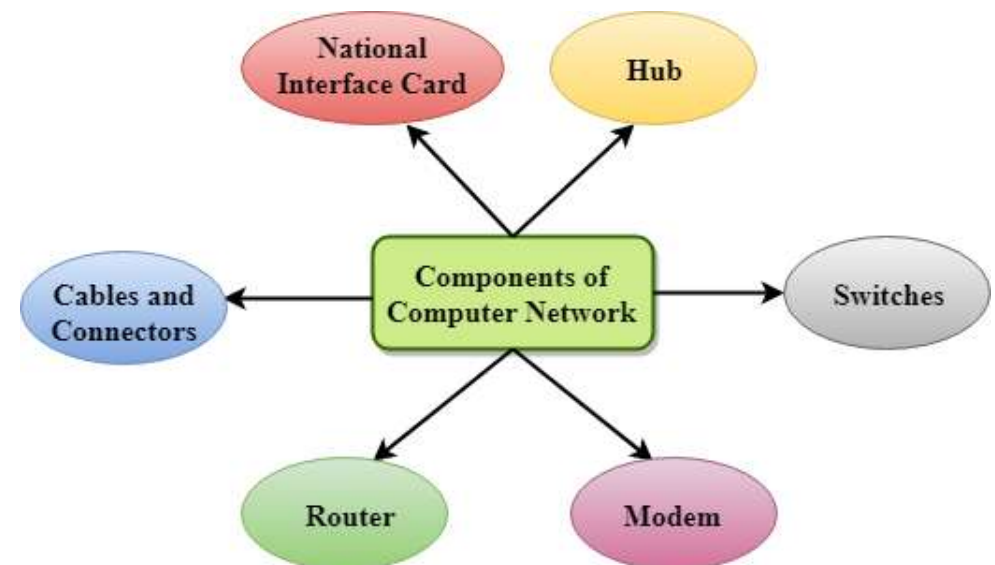
A computer network is a set of devices connected through links. A node can be computer, printer, or any other device capable of sending or receiving the data. The links connecting the nodes are known as communication channel



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Components Of Computer Network:

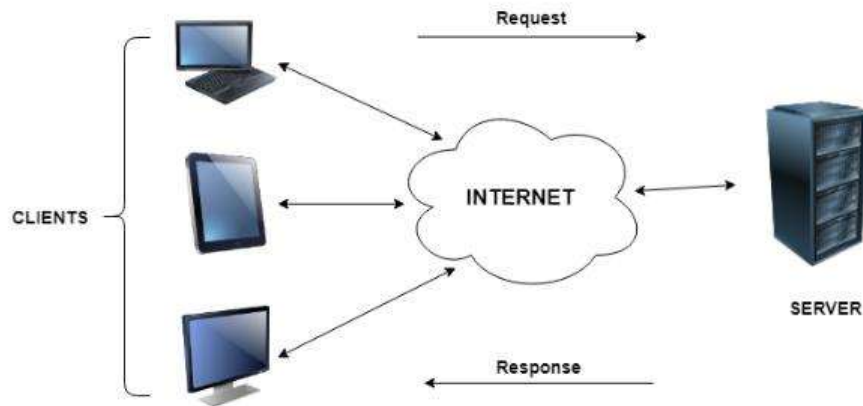


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Client Server Computing

In client server computing, the clients requests a resource and the server provides that resource. A server may serve multiple clients at the same time while a client is in contact with only one server. Both the client and server usually communicate via a computer network



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DATA CENTER

- A large group of networked computer servers typically used by organizations for the remote storage, processing, or distribution of large amounts of data.
- A **data center** is a facility used to house computer systems and associated components, such as [telecommunications](#) and [storage systems](#).

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Data Center Core components



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Data Center Core components



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Network Types

What is an intranet?

An intranet is a private network contained within an enterprise that is used to securely share company information and computing resources among employees.

What is Extranet?

An extranet is an organization's private network and its available only for selected users. It's a way to connect to third parties like vendors, customers, and partners in a secure and controlled way. The users typically have a login mechanism such as username and password to access the network. Extranet in simple terms provides a secure network for an organization to share information with relevant people outside the organization. It is part of an organization's intranet divided via a firewall.

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Overview of Computing Paradigm

Module 1

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Network Types

What is an internet?

A global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols



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Grid Computing

Grid computing is a computing infrastructure that combines computer resources spread over different geographical locations to achieve a common goal.

All unused resources on multiple computers are pooled together and made available for a single task.

Organizations use grid computing to perform large tasks or solve complex problems that are difficult to do on a single computer.

For example, meteorologists use grid computing for weather modeling. Weather modeling is a computation-intensive problem that requires complex data management and analysis. Processing massive amounts of weather data on a single computer is slow and time consuming.

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Components in Grid Computing

Control Node: A computer, usually a server or a group of servers which administrates the whole network and keeps the account of the resources in the network pool.

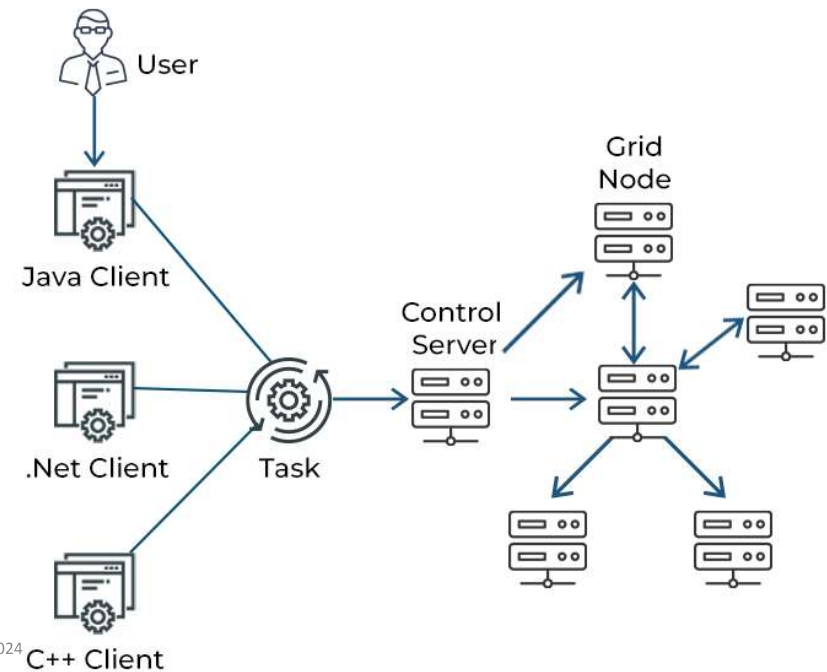
Provider: The computer contributes its resources to the network resource pool.

User: The computer that uses the resources on the network.

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HOW GRID COMPUTING WORKS



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Cluster Computing

Cluster computing is a collection of tightly or loosely connected computers that work together so that they act as a single entity.

The connected computers execute operations all together thus creating the idea of a single system.

The clusters are generally connected through fast local area networks (LANs)

A computer cluster can provide faster processing speed, larger storage capacity, better data integrity, greater reliability and wider availability of resources.

Computer clusters are usually dedicated to specific functions, such as load balancing, high availability, high performance or large-scale processing.

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Types of Cluster computing

High performance (HP) clusters :

HP clusters use computer clusters and supercomputers to solve advance computational problems. They are used to performing functions that need nodes to communicate as they perform their jobs. They are designed to take benefit of the parallel processing power of several nodes.

Load-balancing clusters :

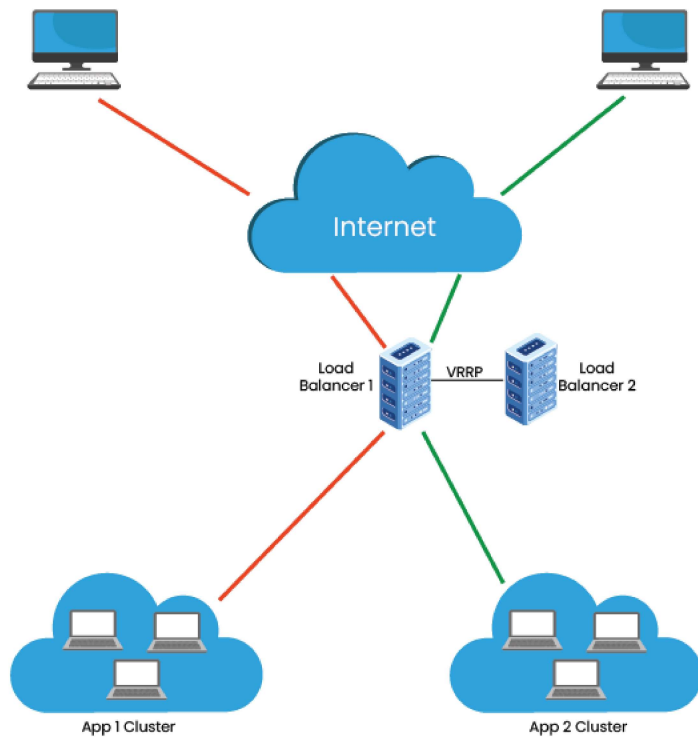
Incoming requests are distributed for resources among several nodes running similar programs or having similar content. This prevents any single node from receiving a disproportionate amount of task. This type of distribution is generally used in a web-hosting environment.

High Availability (HA) Clusters :

HA clusters are designed to maintain redundant nodes that can act as backup systems in case any failure occurs. Consistent computing services like business activities, complicated databases, customer services like e-websites and network file distribution are provided. They are designed to give uninterrupted data availability to the customers.

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Technicians working on a large [Linux](#) cluster at the [Chemnitz University of Technology](#), Germany



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Sun Microsystems [Solaris Cluster](#), with [In-Row cooling](#)



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Distributed Computing

Distributed computing is a model in which components of a software system are shared among multiple computers or nodes.

Even though the software components may be spread out across multiple computers in multiple locations, they're run as one system. This is done to improve efficiency and performance.

The systems on different networked computers communicate and coordinate by sending messages back and forth to achieve a defined task.

Distributed computing can increase performance, resilience and scalability, making it a common computing model in database and application design.

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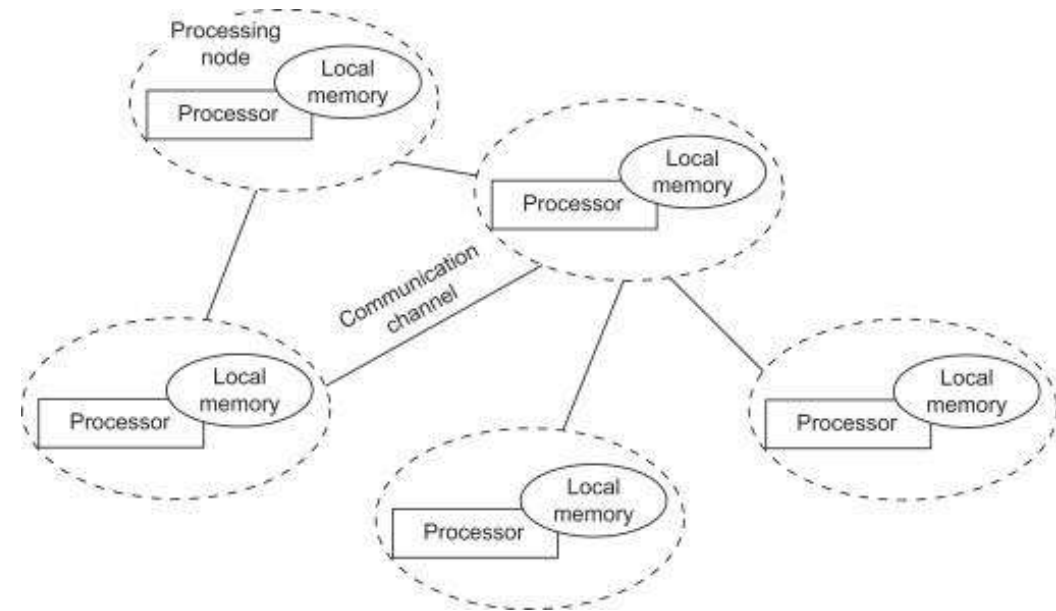
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Types of distributed computing

Client-server architectures. These use smart clients that contact a server for data, then format and display that data to the user.

N-tier system architectures. Typically used in application servers, these architectures use web applications to forward requests to other enterprise services.

Peer-to-peer architectures. These divide all responsibilities among all peer computers, which can serve as clients or servers.



Utility Computing

Utility computing is defined as a service provisioning model that offers computing resources to clients as and when they require them on an on-demand basis. The charges are exactly as per the consumption of the services provided, rather than a fixed charge or a flat rate.

The utility computing model is based on conventional utilities and originates from the process of making IT resources as easily available as traditional public utilities such as electricity, gas, water, and telephone services.

For example, a consumer pays his electricity bill as per the number of units consumed, nothing more and nothing less. Similarly, utility computing works on the same concept, which is a pay-per-use model.

Web services

A web service is a software system that supports interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format

A web service is described using a standard, formal XML notion, called its service description, that provides all of the details necessary to interact with the service, including message formats (that detail the operations), transport protocols, and location.

The nature of the interface hides the implementation details of the service so that it can be used independently of the hardware or software platform on which it is implemented and independently of the programming language in which it is written.

A web service is a set of open protocols and standards that allow data to be exchanged between different applications or systems

Components of Web Service

SOAP (Simple Object Access Protocol)

SOAP stands for “Simple Object Access Protocol.” It is a transport-independent messaging protocol. SOAP is built on sending XML data in the form of SOAP Messages.

A document known as an XML document is attached to each message. Only the structure of the XML document, not the content, follows a pattern.

The best thing about Web services and SOAP is that everything is sent through HTTP, the standard web protocol.

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Components of Web Service

WSDL (Web Services Description Language)

If a web service can't be found, it can't be used. The client invoking the web service should be aware of the location of the web service.

Second, the client application must understand what the web service does in order to invoke the correct web service.

The WSDL, or Web services description language, is used to accomplish this. The WSDL file is another XML-based file that explains what the web service does to the client application.

The client application will be able to understand where the web service is located and how to use it by using the WSDL document.

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Components of Web Service

UDDI (Universal Description, Discovery, and Integration)

UDDI is a standard for specifying, publishing and discovering a service provider's online services.

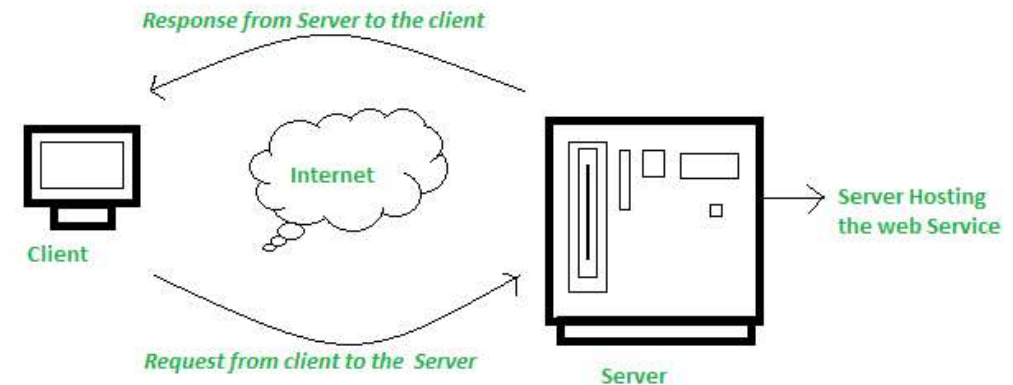
It provides a specification that aids in the hosting of data via web services.

UDDI provides a repository where WSDL files can be hosted so that a client application can discover a WSDL file to learn about the various actions that a web service offers.

As a result, the client application will have full access to the UDDI, which serves as a database for all WSDL files.

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Introduction to Cloud Computing

Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, software, analytics, intelligence, and more, over the Cloud (Internet).

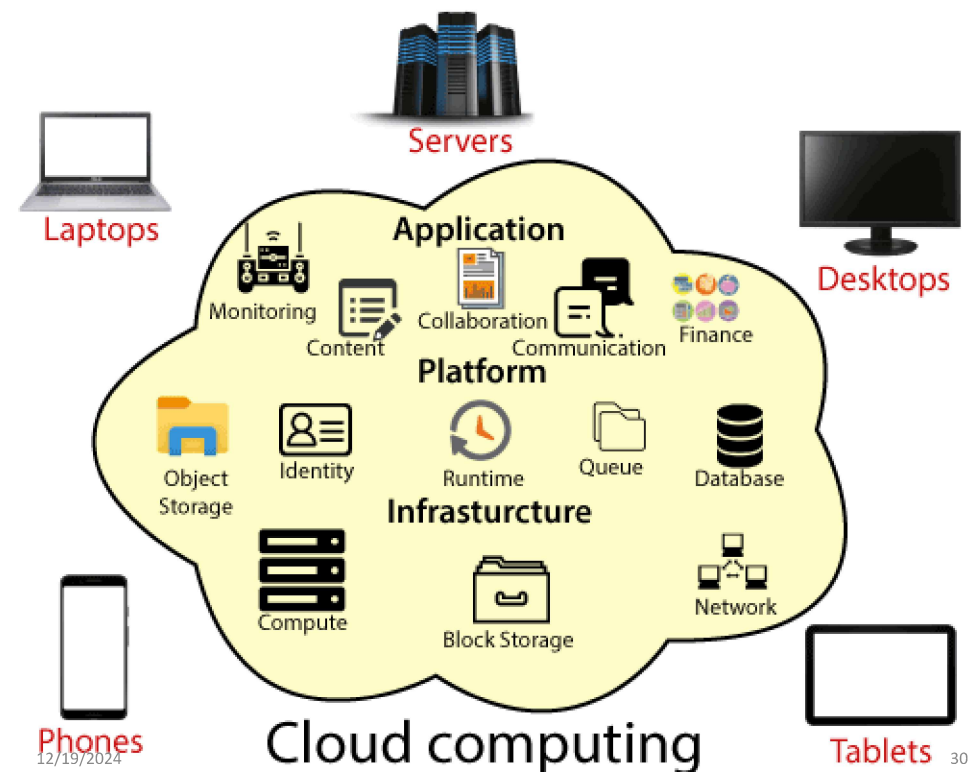
Cloud is:

- ✓ A delivery model
- ✓ A service / utility
- ✓ A pay for use model

The cloud environment provides an easily accessible online portal that makes handy for the user to manage the compute, storage, network, and application resources

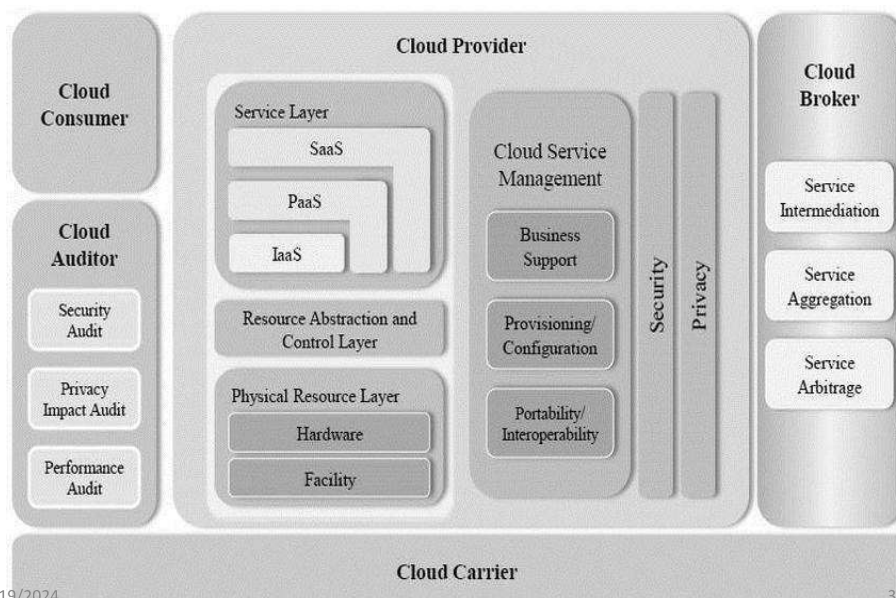
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NIST cloud computing reference architecture



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