Badji Mokhtar University - Annaba
Faculty of Technology
Department of Computer sciences

Information & Communication Technology

Presented by:

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2023-2024

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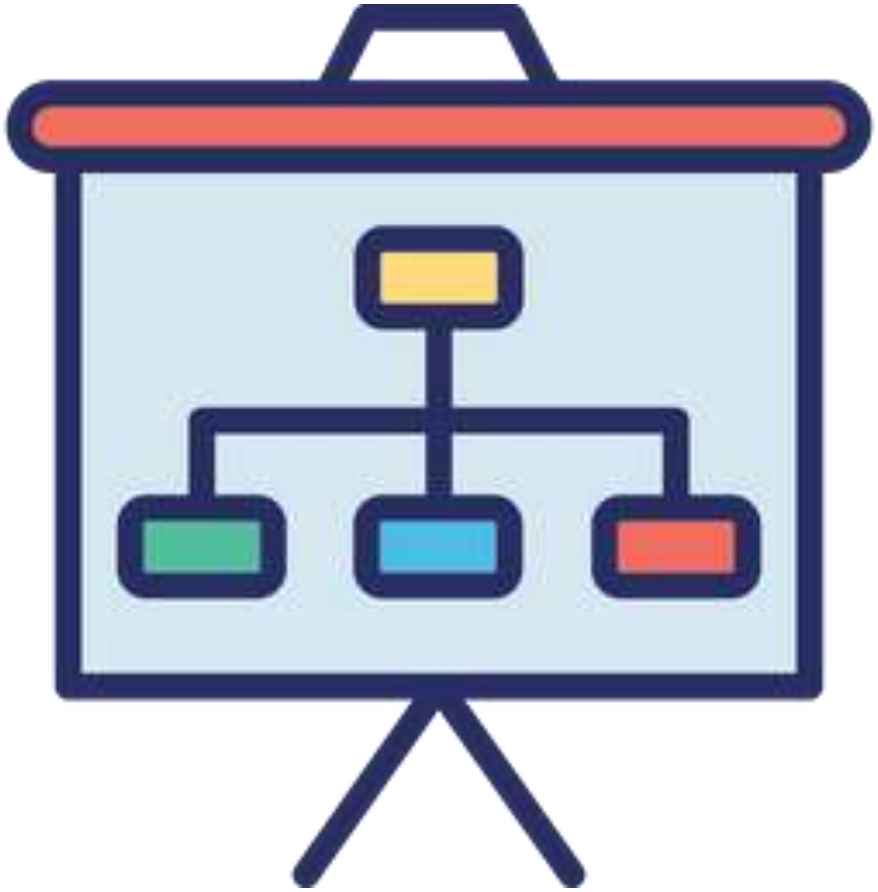

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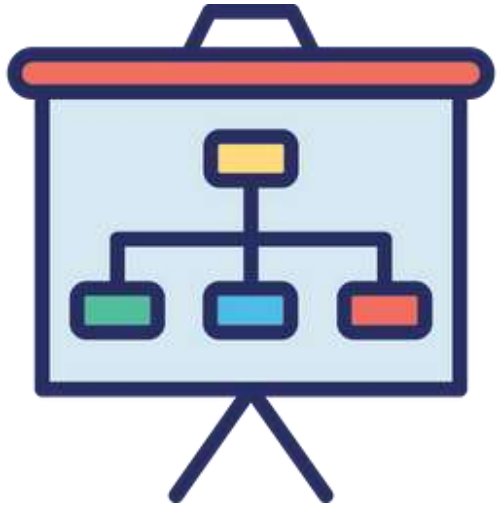
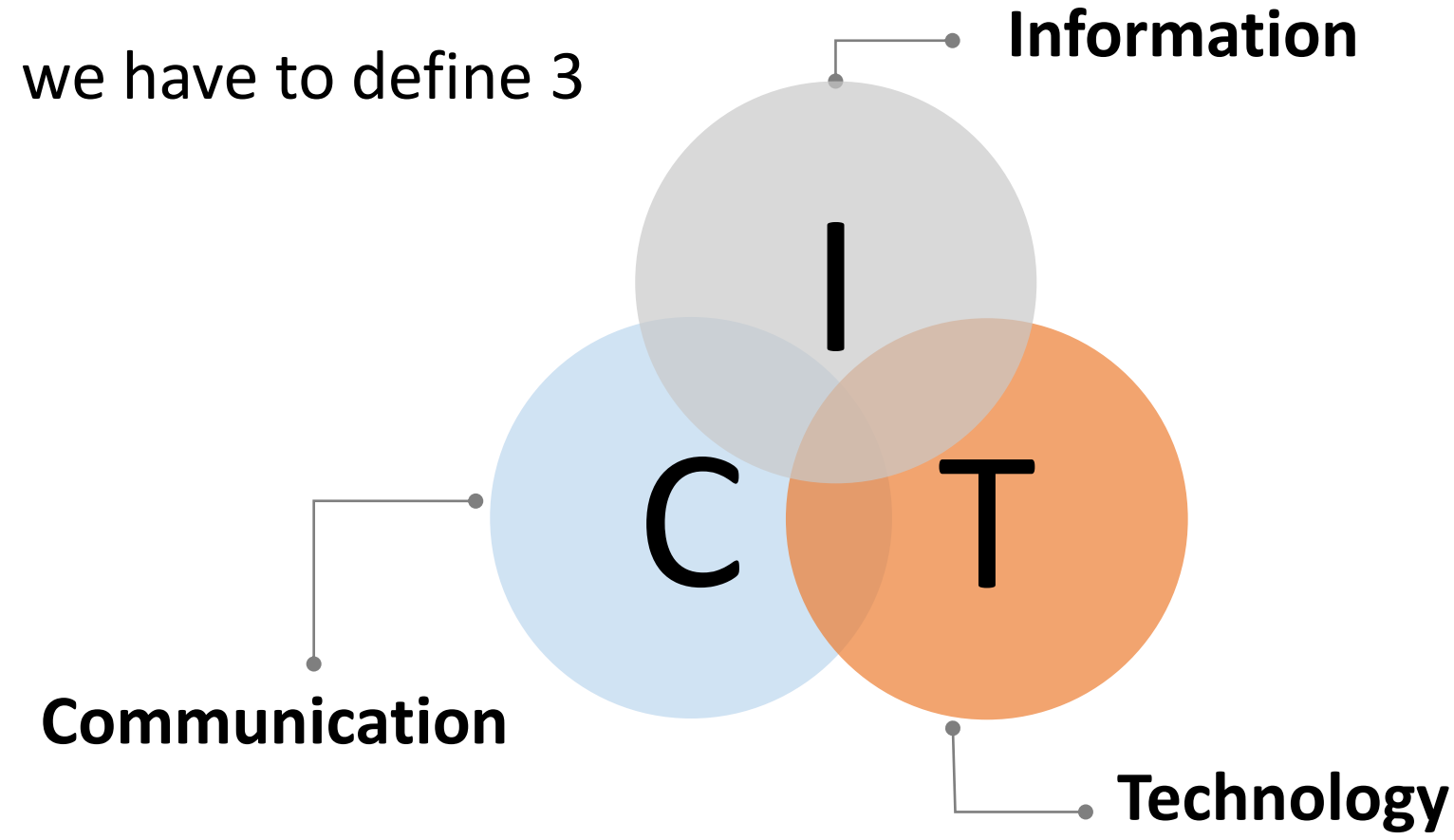
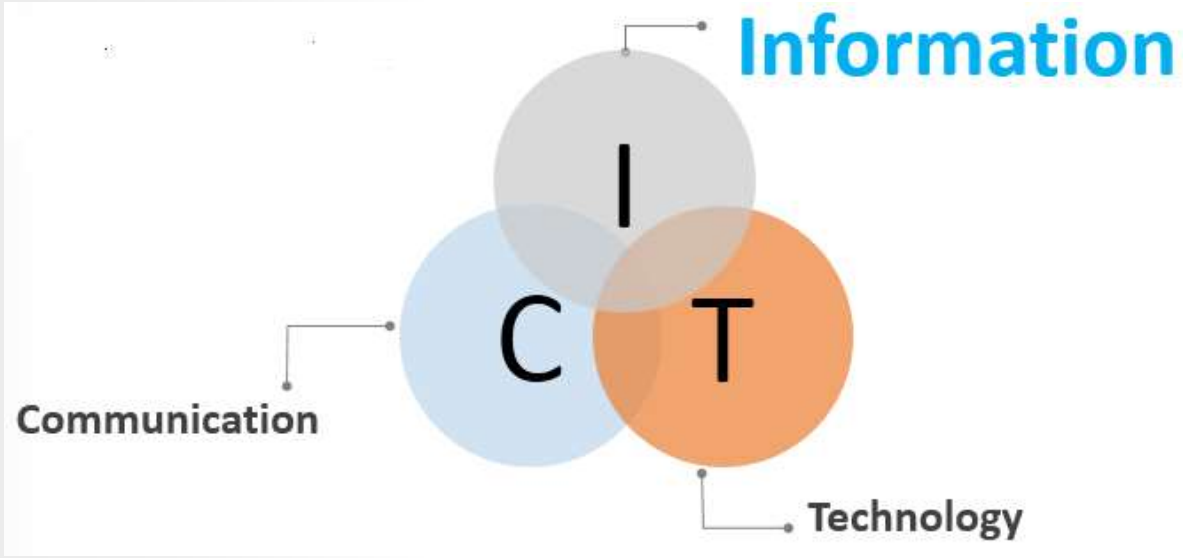


ICT: Tools and Applications

To define ICT, we have to define 3 concepts:



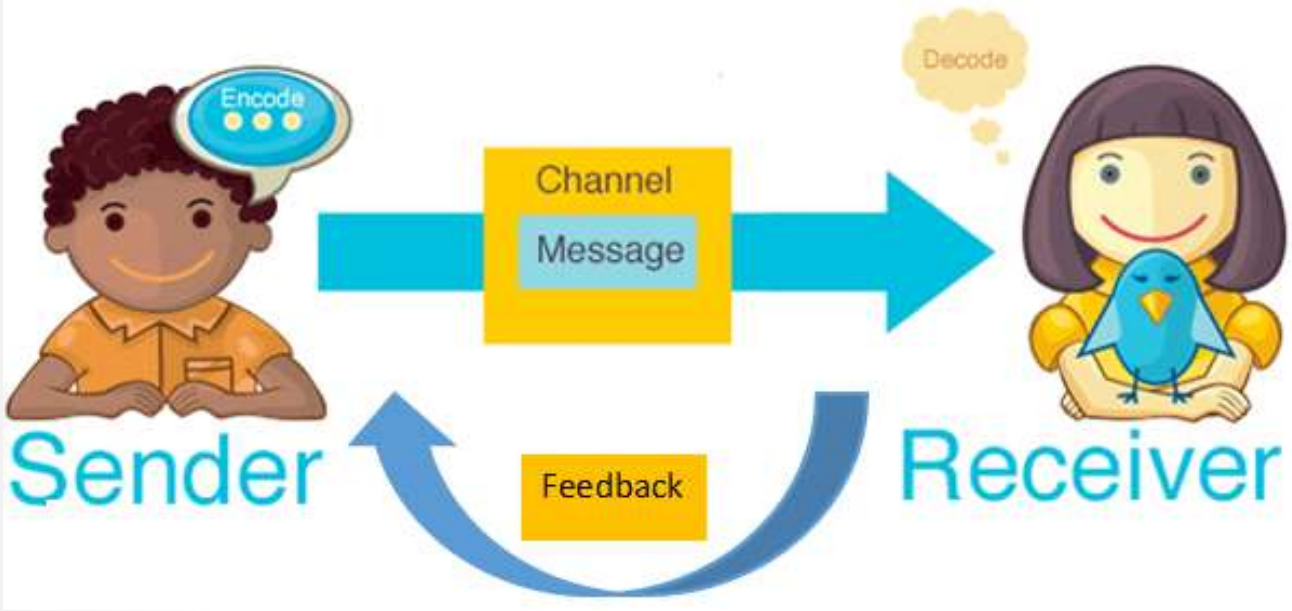
01



The information has two meanings:

- **From a technical standpoint:** information is a sign, a symbol, an element that can be transmitted and stored.

- **Information in the sense of intelligence:** data that provides knowledge, information about an object, or an event.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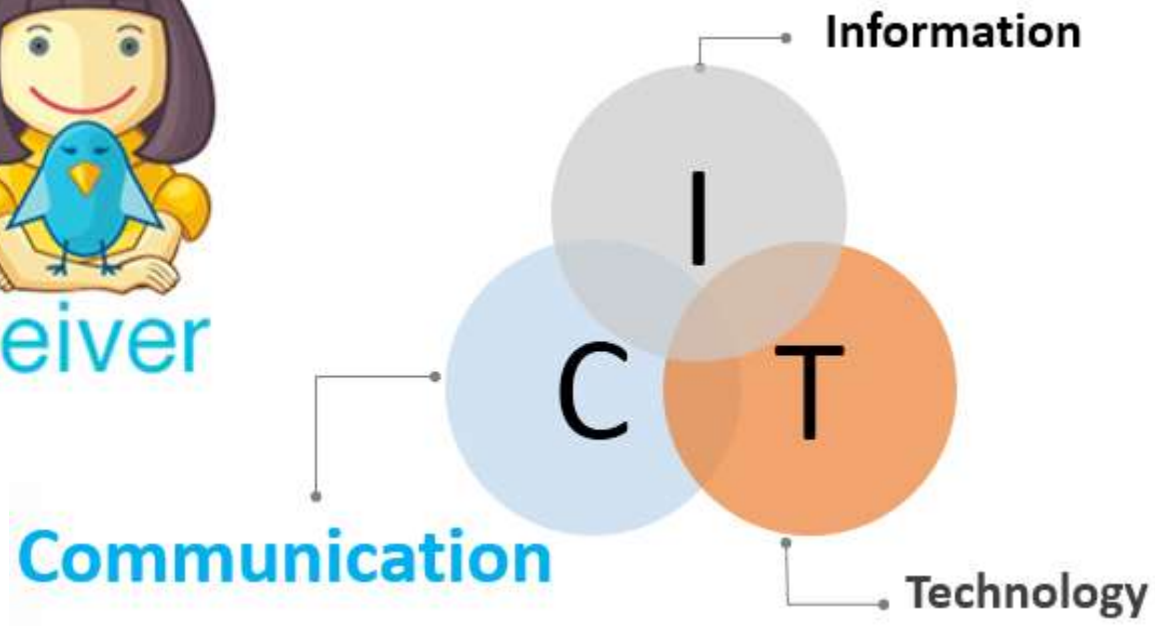
Decode
Channel
Message
Sender
Feedback
Receiver


Information
I
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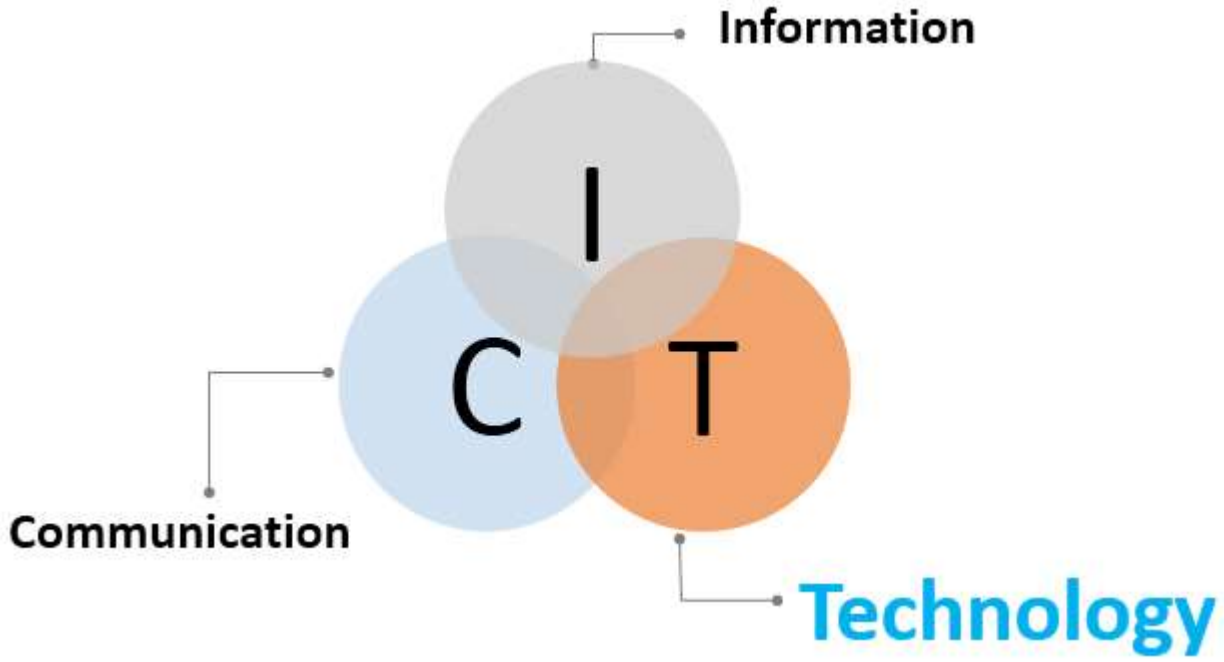
Communication
Technology

03

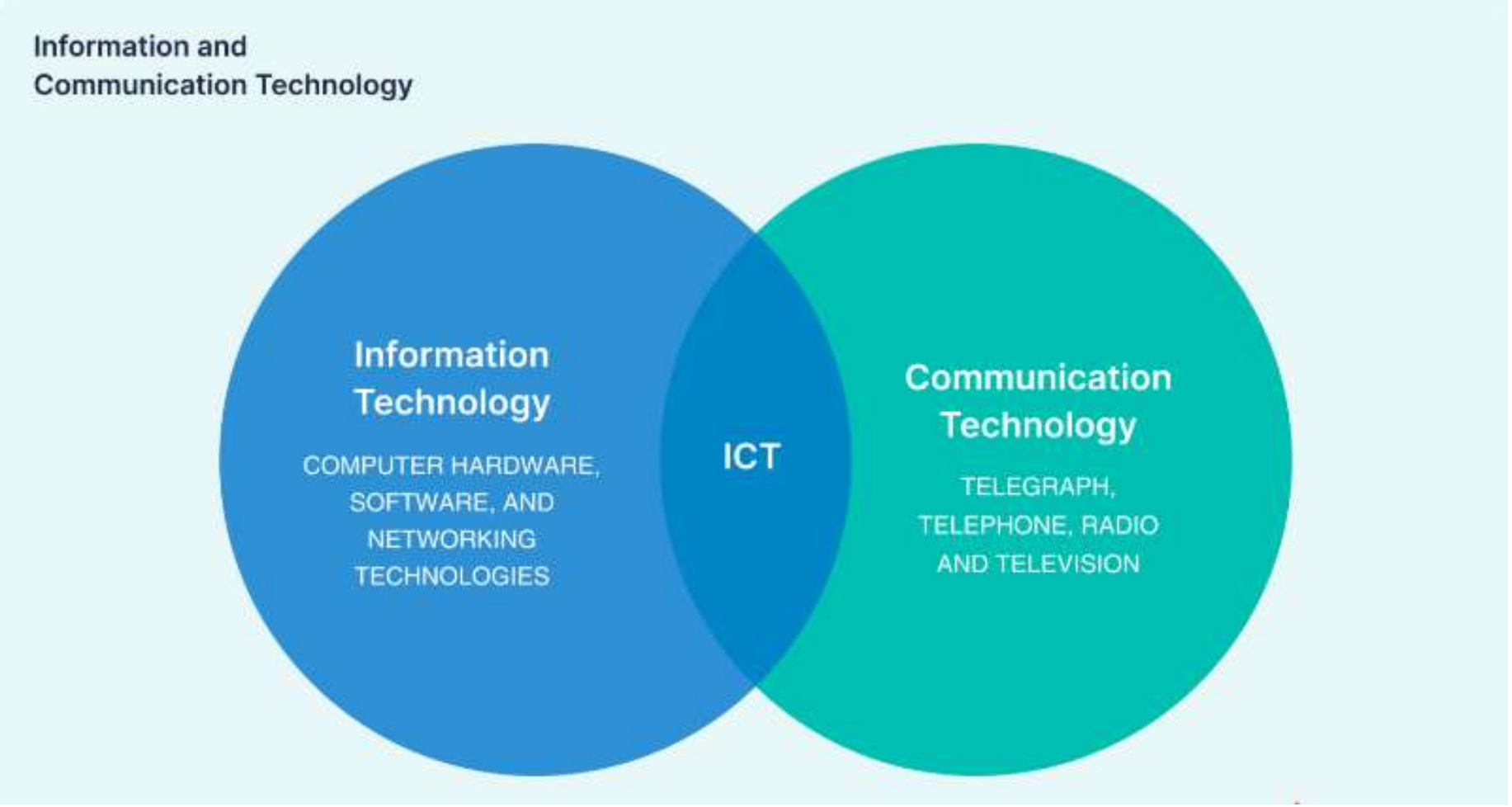


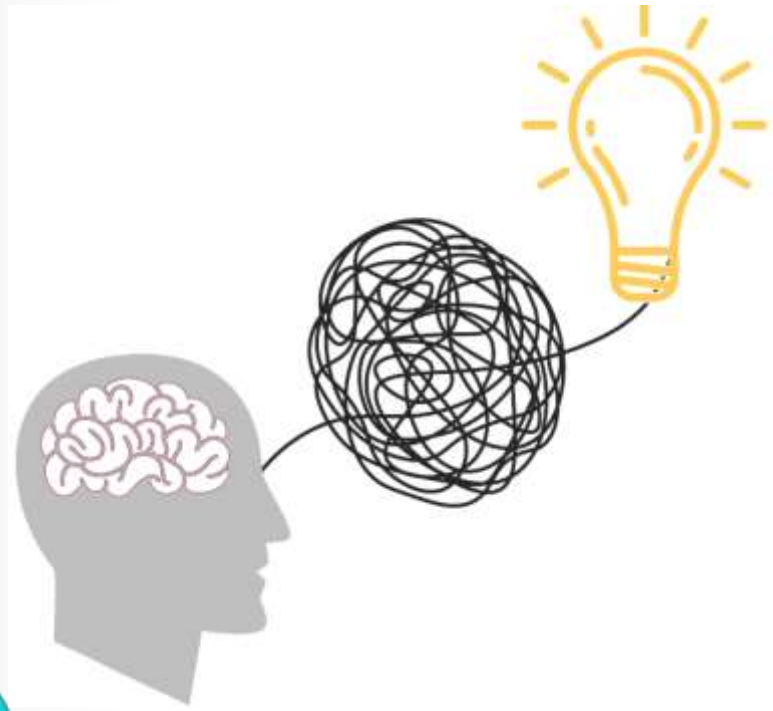
Technology can be defined as the application of scientific knowledge, skills, and resources to create tools, machines, systems, and processes that solve problems.

What is Information & Communication Technology?

- It encompass all the **tools**, **services,** and **techniques** used for the **creation**, **recording**, **processing**, and **transmission** of information.

- So, it primarily involves **computing**, **the Internet**, **radio and television** (live and recorded), and **telecommunications**.


Information and
Communication Technology
Information Technology
COMPUTER HARDWARE, SOFTWARE, AND NETWORKING TECHNOLOGIES
ICT
Communication Technology
TELEGRAPH, TELEPHONE, RADIO AND TELEVISION



New Information and Communication Technologies" (NICT) is also used to refer to tools resulting from the convergence of computing, telecommunications, and audiovisual technologies, such as smartphones, personal computers, tablets, the Cloud, etc.

NTIC vs TIC

The NTICS (New ICTs):

- The term ICT (Information and Communication Technologies) is a francophone term used in the 1990s.
- It was used to distinguish technologies based on the Internet from traditional means of telecommunications.

Tools of ICT

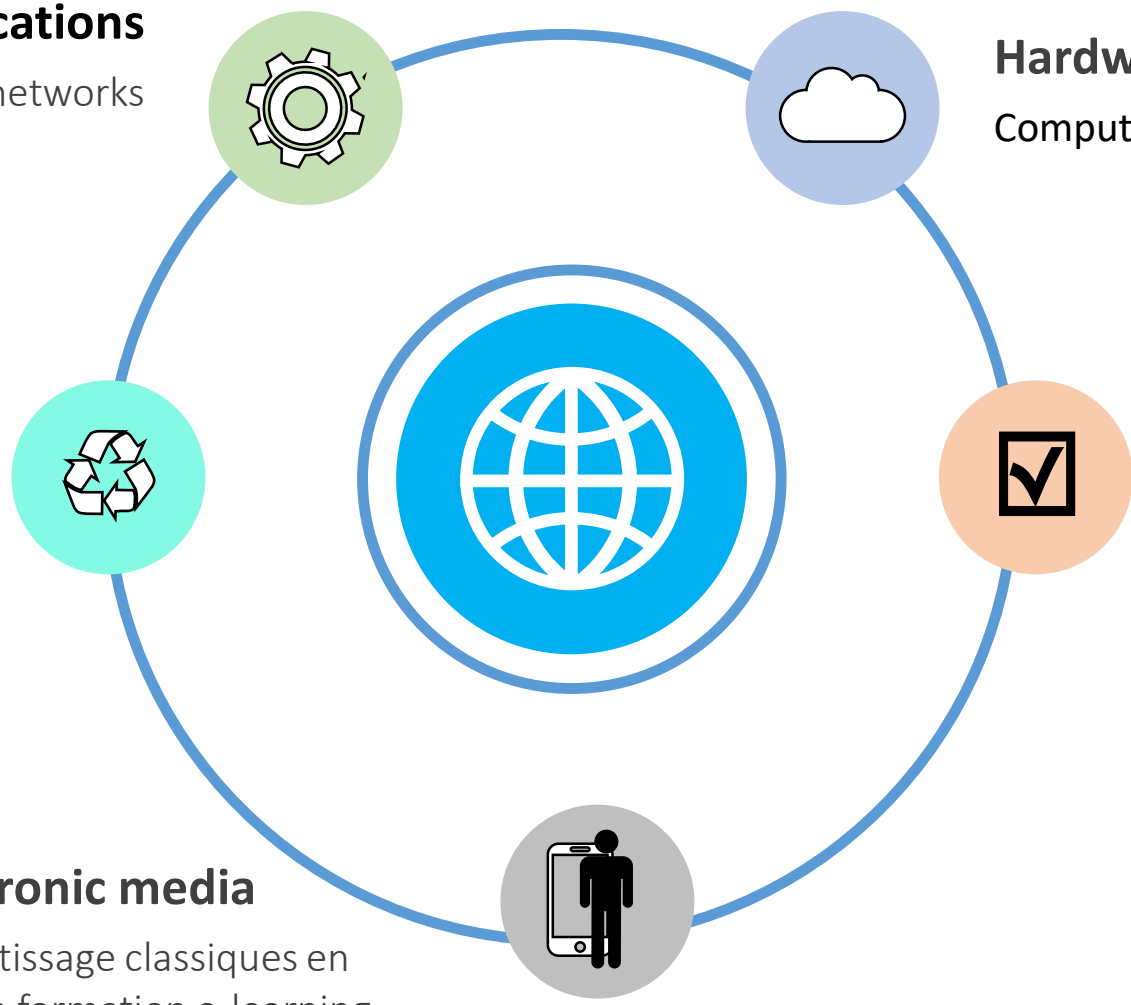
ICT encompass a set of resources necessary for manipulating information, especially the computers, programs, and networks required to convert, store, manage, transmit, and retrieve it.

Tools of ICT

We can categorize ICT into the following sectors:

Telecommunications

Telecommunications and computer networks



Hardware

Computer equipment, servers…

Multimedia

Software

The IT services and software.

E-commerce and electronic media

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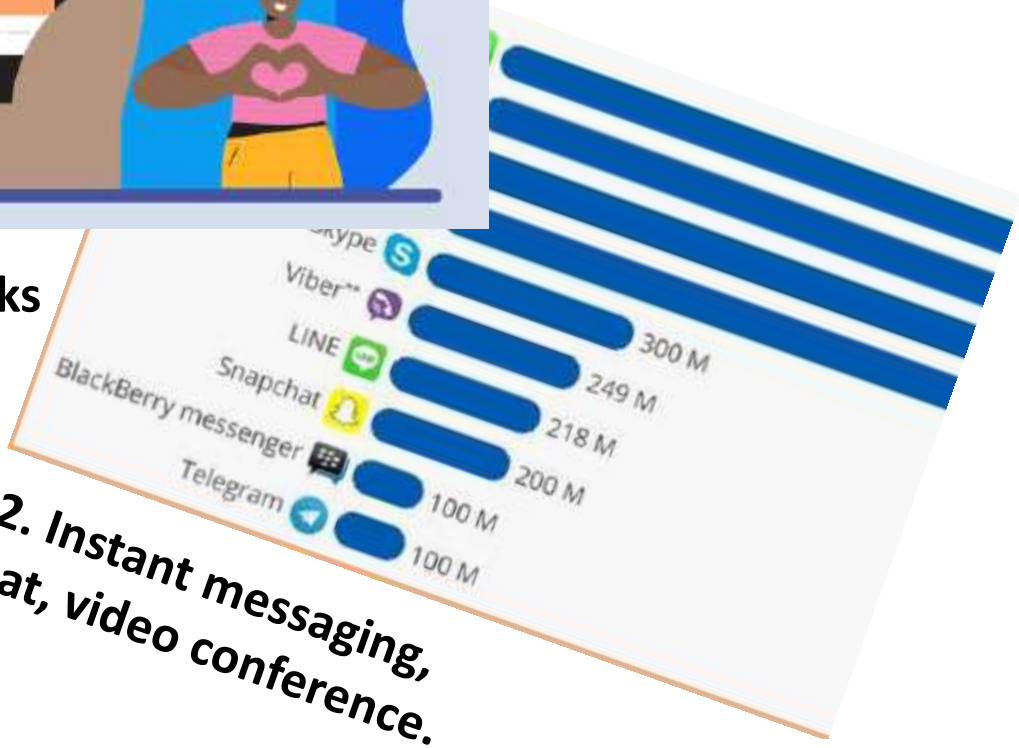
Application domains of ICT

- ICT plays a major role in the competitiveness of businesses and in the efficiency of administrations and public services (health, education, security).
- ICT has also become a crucial issue for the production and dissemination of cultural goods.
- These technologies present themselves as a necessity in the context of a society where rapid changes, increasing knowledge, and demands for constantly updated high-level education are transforming into a permanent requirement.
- This concerns almost all areas of our society, with the main application domains being administration and governance; education; training; health; commerce: Websites can be used for online shopping; geolocation; transportation: Electronic ticketing and online reservations...

ICT Communication tools

1. Traditional email, SMS,

3. Social Networks



2. Instant messaging, chat, video conference.

Advantages of investing in ICT

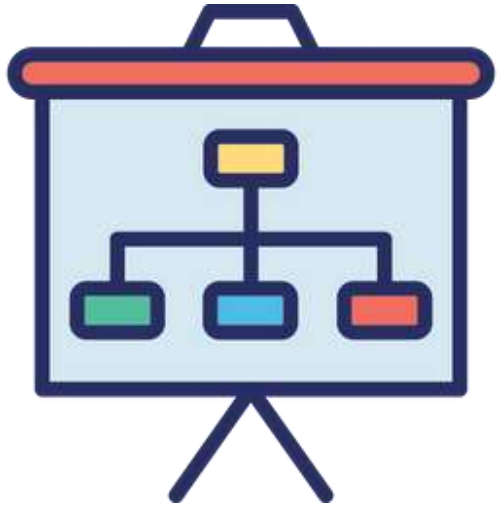
It simplifies everyday life. Almost all popular technologies, from phones to cars, have the ultimate goal of reducing human effort.

Modern communication systems have drastically reduced the communication time between two individuals. Today, communication between different countries is almost instantaneous..

Technology has also increased the productivity of almost every industry in the world.

DOWNLOAD

At the medical level, progress allows for the treatment of more diseases and, consequently, the saving of many human lives.

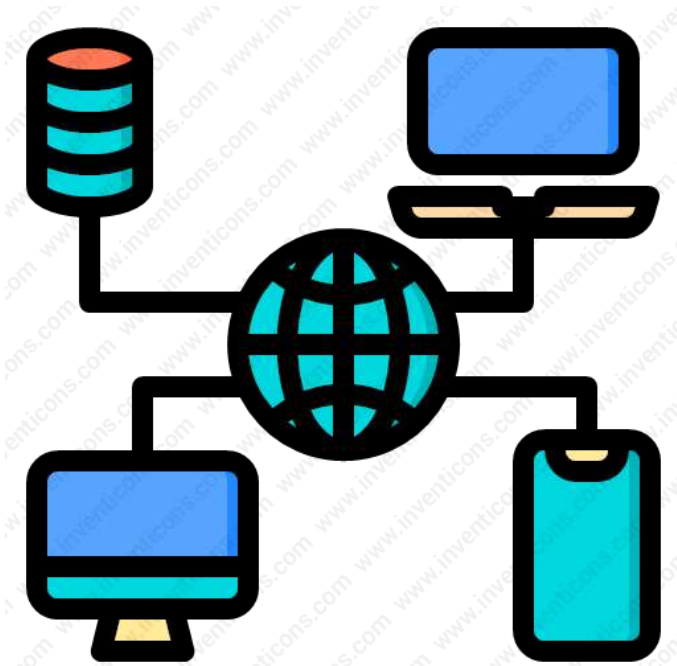


The computer networks

What is a computer network?

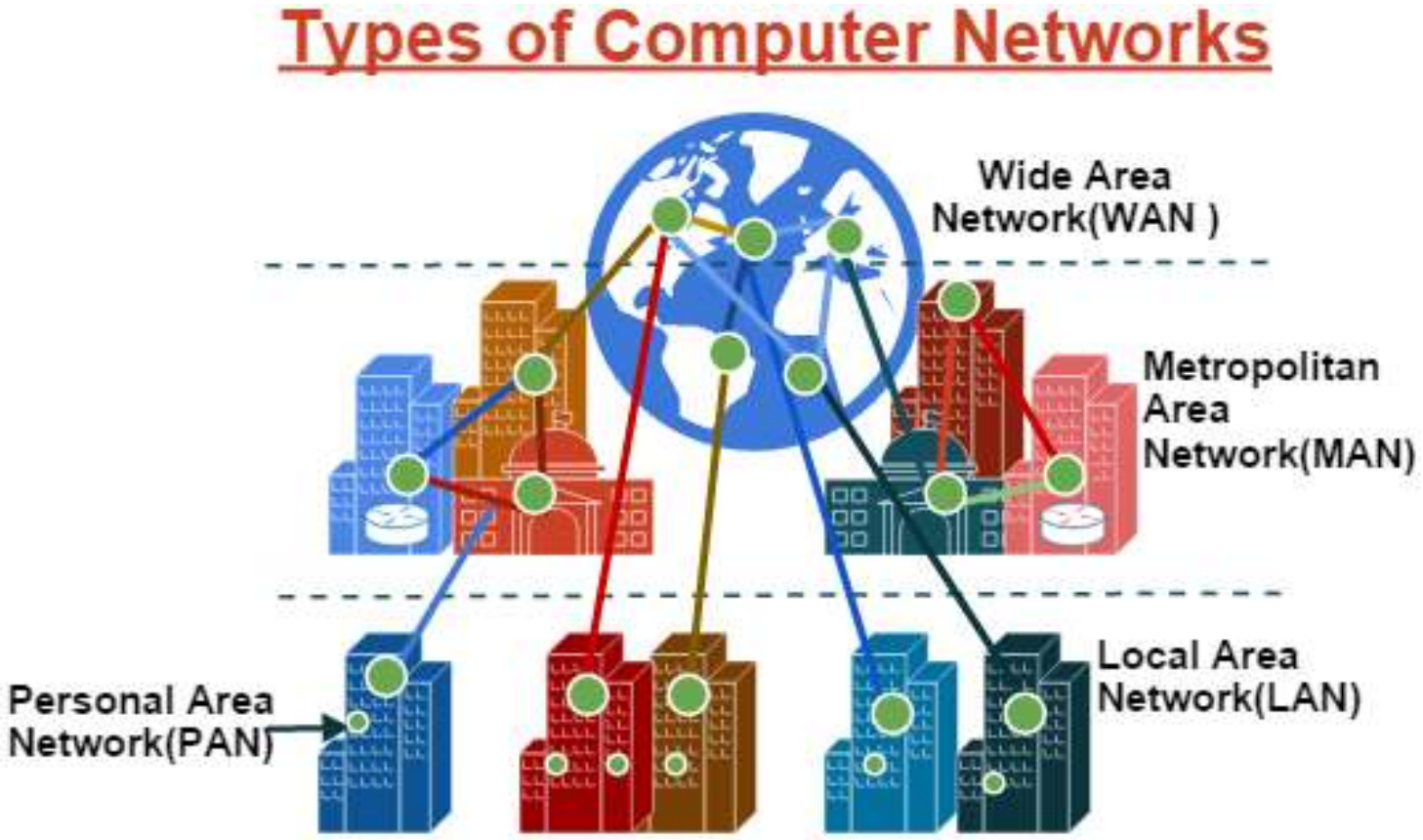
- The computer network refers to interconnected computing devices that can exchange data and share resources among themselves.

- Computer networks allow users to communicate with each other and transfer information. Data transmissions can involve exchanging messages between users, remote access to databases, or sharing files.



The types of computer network ?

There are several types of computer networks, each designed to meet specific needs. Here are some of the main types of networks:

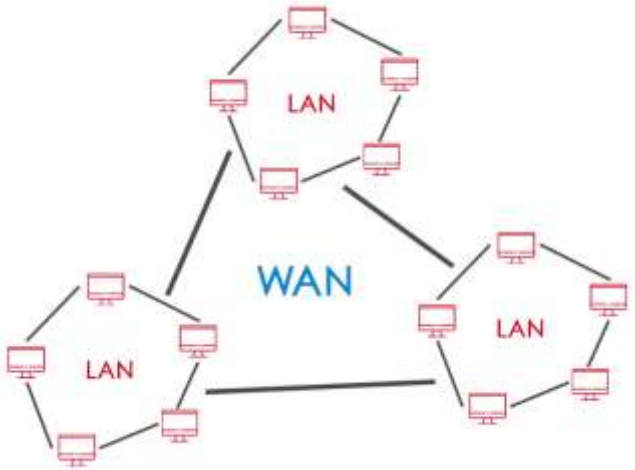


A PAN consists of a wireless modem, one or two computers, mobile phones, printers, tablets, etc. These types of networks are usually managed from a single device by one person or organization.

PAN

It is a computer network on a relatively small geographic scale, used to connect computers within a specific area, such as a private residence, a business, a computer lab, or a building

LAN



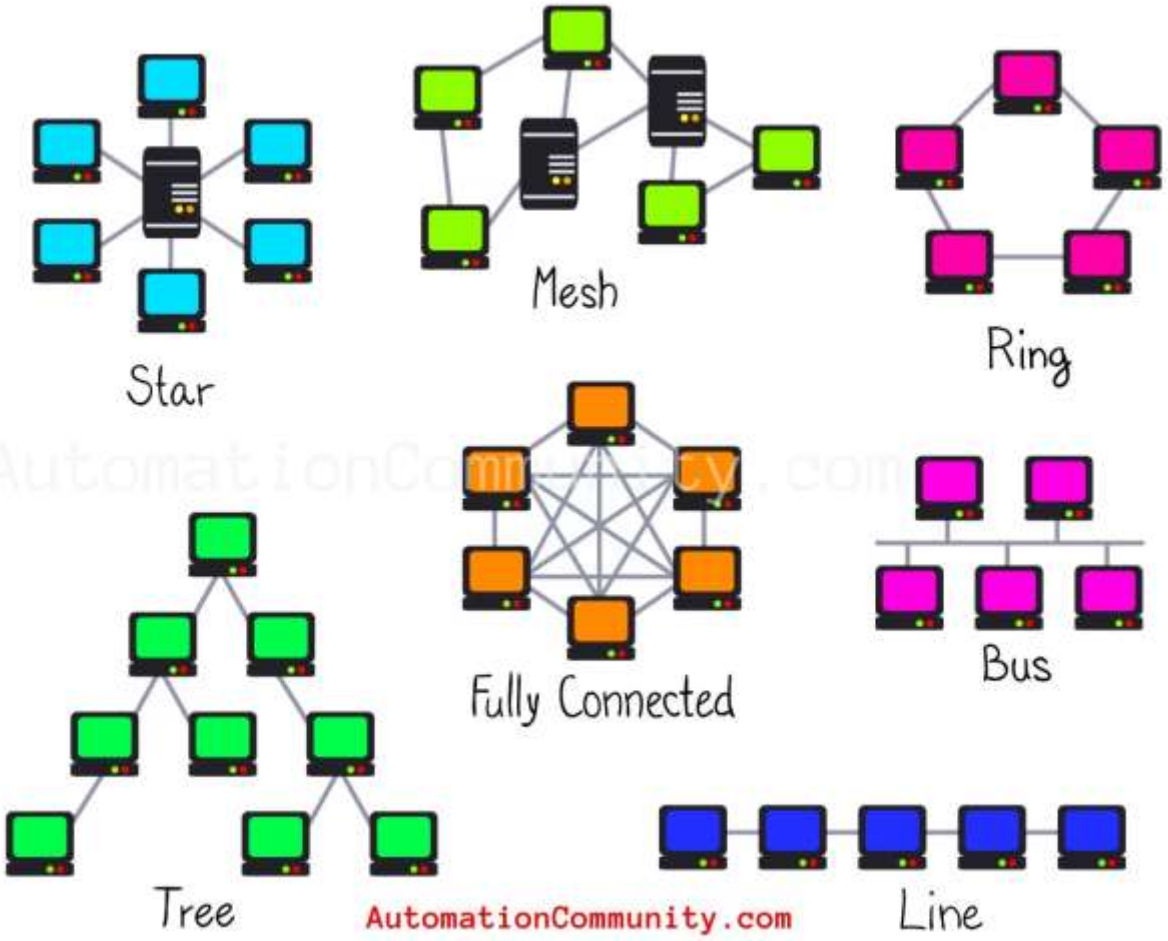
It is a Metropolitan Area Network (MAN), which refers to a network composed of computers typically used in campuses or cities.

MAN

WAN

is a network covering a large geographical area, at the scale of a country, a continent, or even the entire planet. It facilitates the interconnection of local and metropolitan networks to the global internet

Network Topology



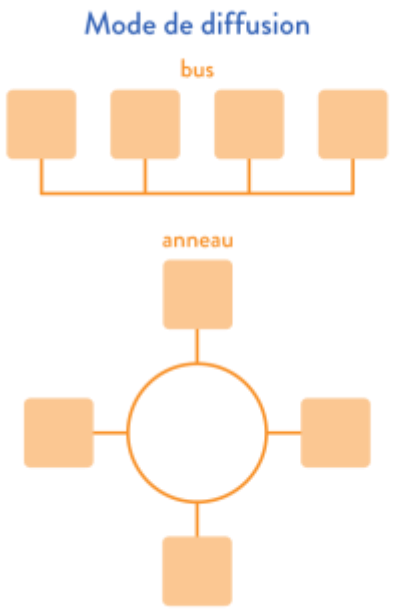
A network topology in computer science is a definition of the architecture of a network. It provides a specific arrangement of different computer stations within the network and a hierarchy of these stations

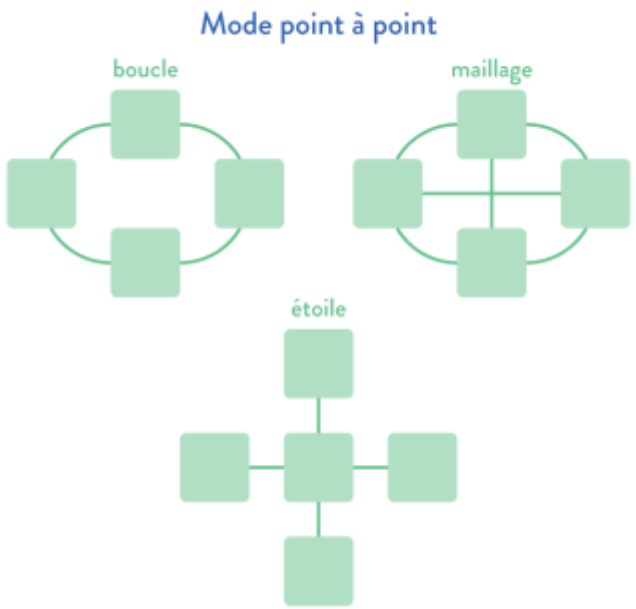
Network Topology – propagation modes

There are 2 propagation modes classifying the topologies of computer networks

Broadcast

The principle is that the message is sent over the network, allowing every network unit to see the message and analyze, based on the recipient's address, whether the message is intended for it or not.





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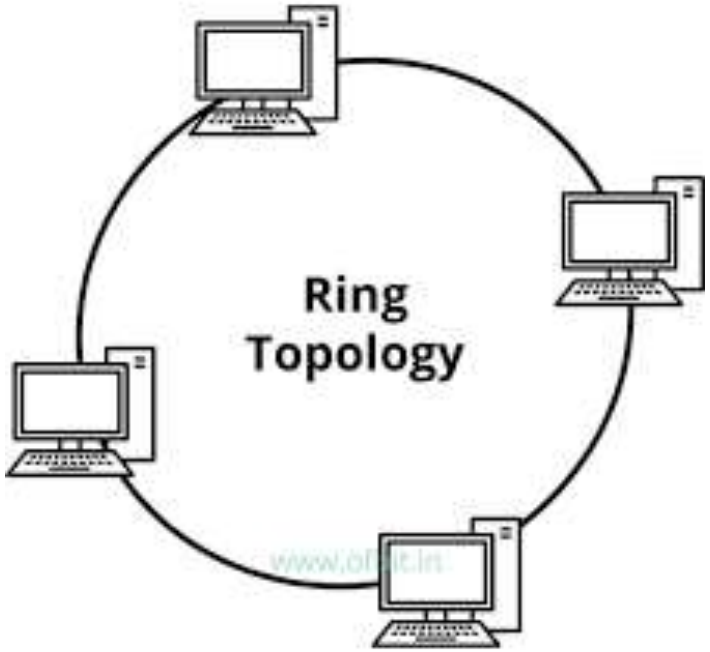
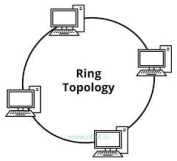
Point to point

In this mode, the physical medium connects only a pair of units. For two network units to communicate, they must pass through an intermediary (the node).

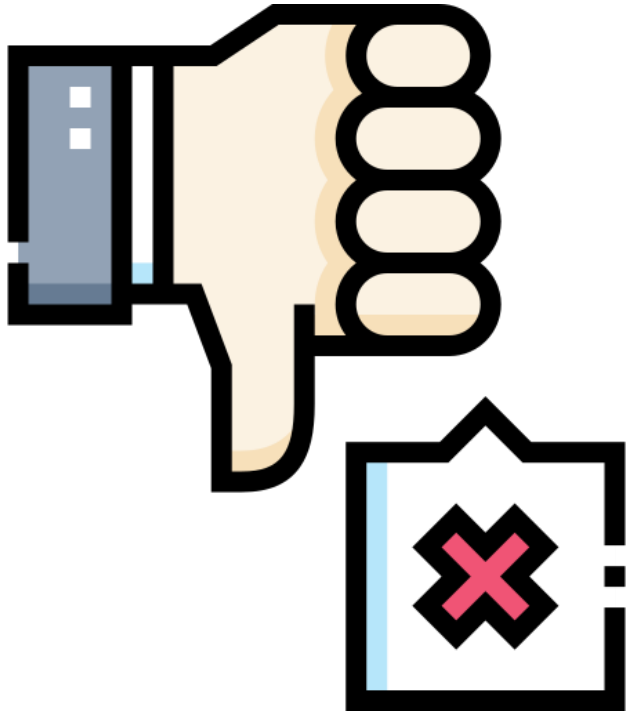
Ring Topology



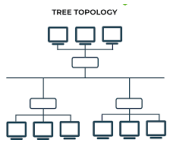
- A network has a ring topology when all its stations are connected in a chain to one another through a point-to-point link.
- Each station acts as an intermediary. Each station that receives a frame interprets it and retransmits it to the next station in the loop if necessary.



Ring Topology



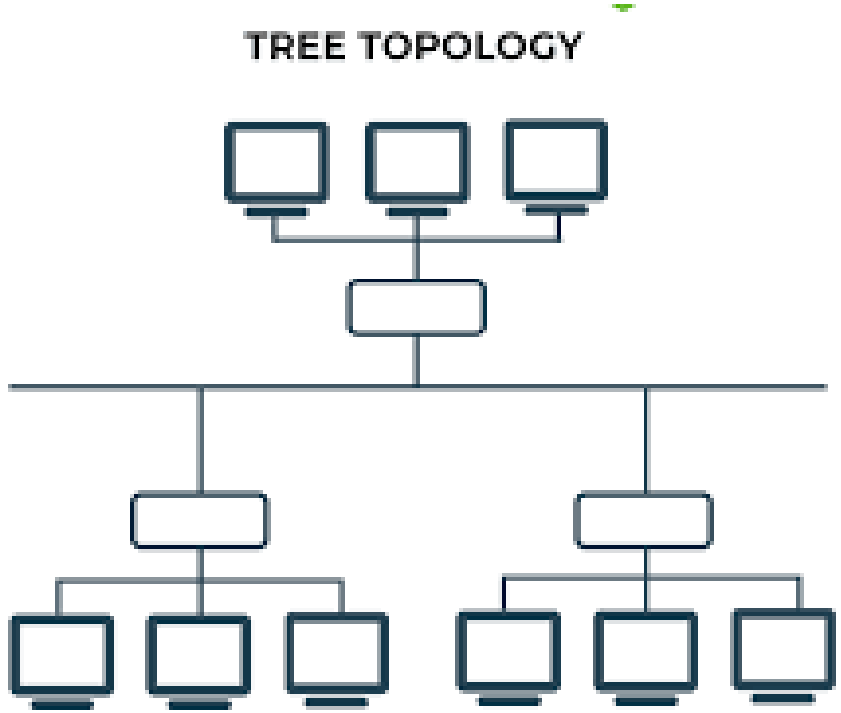
- The failure of a node **disrupts** the ring structure if communication is **unidirectional**.
- In the event of a **collision** between two messages, both messages will be **lost**.

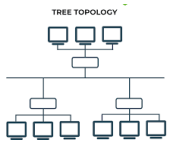


Tree topology

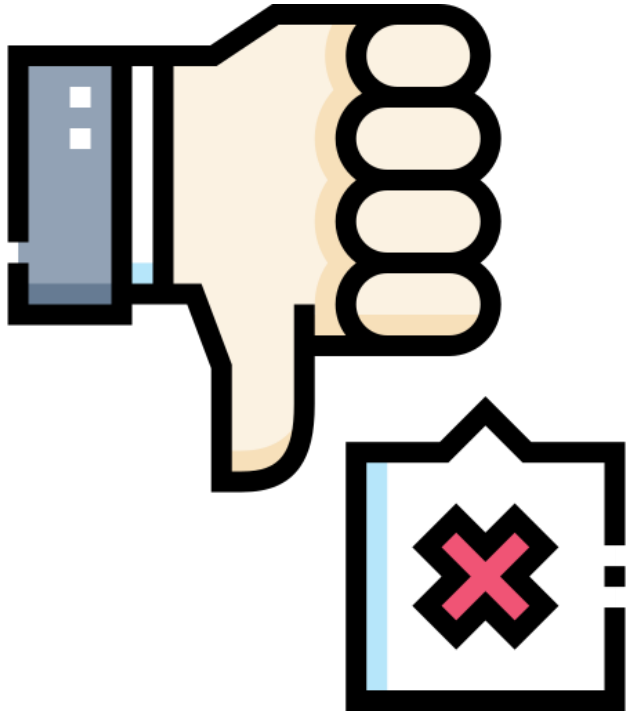
- In a tree topology, computers and network devices are arranged hierarchically, resembling an organizational tree with a **root node** at the top and **branches** extending downward.

- Tree topology is commonly used **in Wide Area Networks (WANs)** and can be implemented using various network devices like switches and routers.





Tree topology

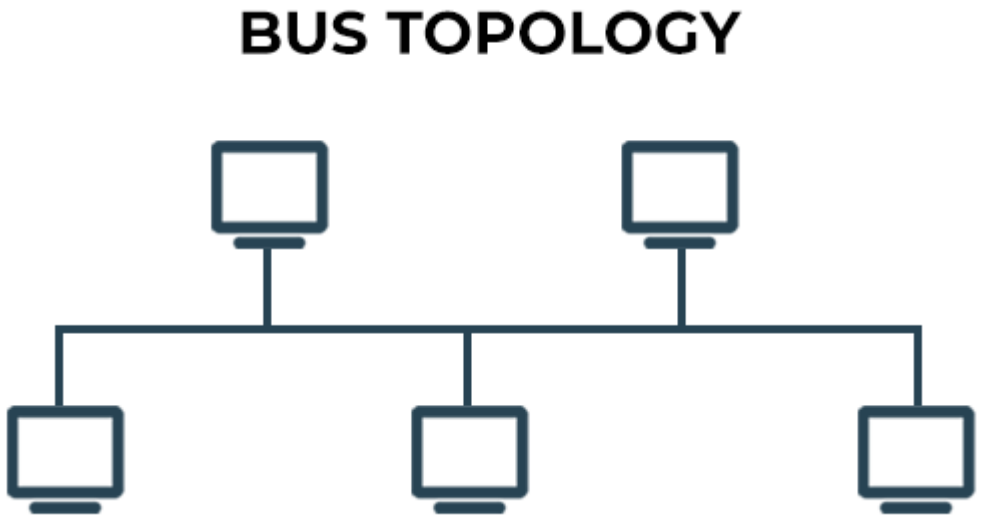


- The central hub or main switch represents a single point of failure. If the central hub **fails**, it can **disrupt** communication to the entire network.
- Implementing and managing a tree topology can become **complex** as the network grows.

Bus topology

- Bus topology is a type of network topology in which all devices share a **common communication medium**, which is typically a single cable called the "bus." In a bus topology, each device has a unique address to identify its location on the bus.

- All data transmitted by **one** device is accessible to **all** other devices on the bus.



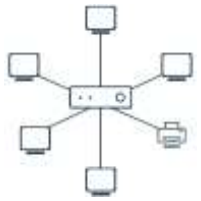
Bus topology

Bus topology is relatively easy to install and requires less cabling compared to other topologies like star or ring

Adding more devices can lead to increased collisions and reduced overall network efficiency

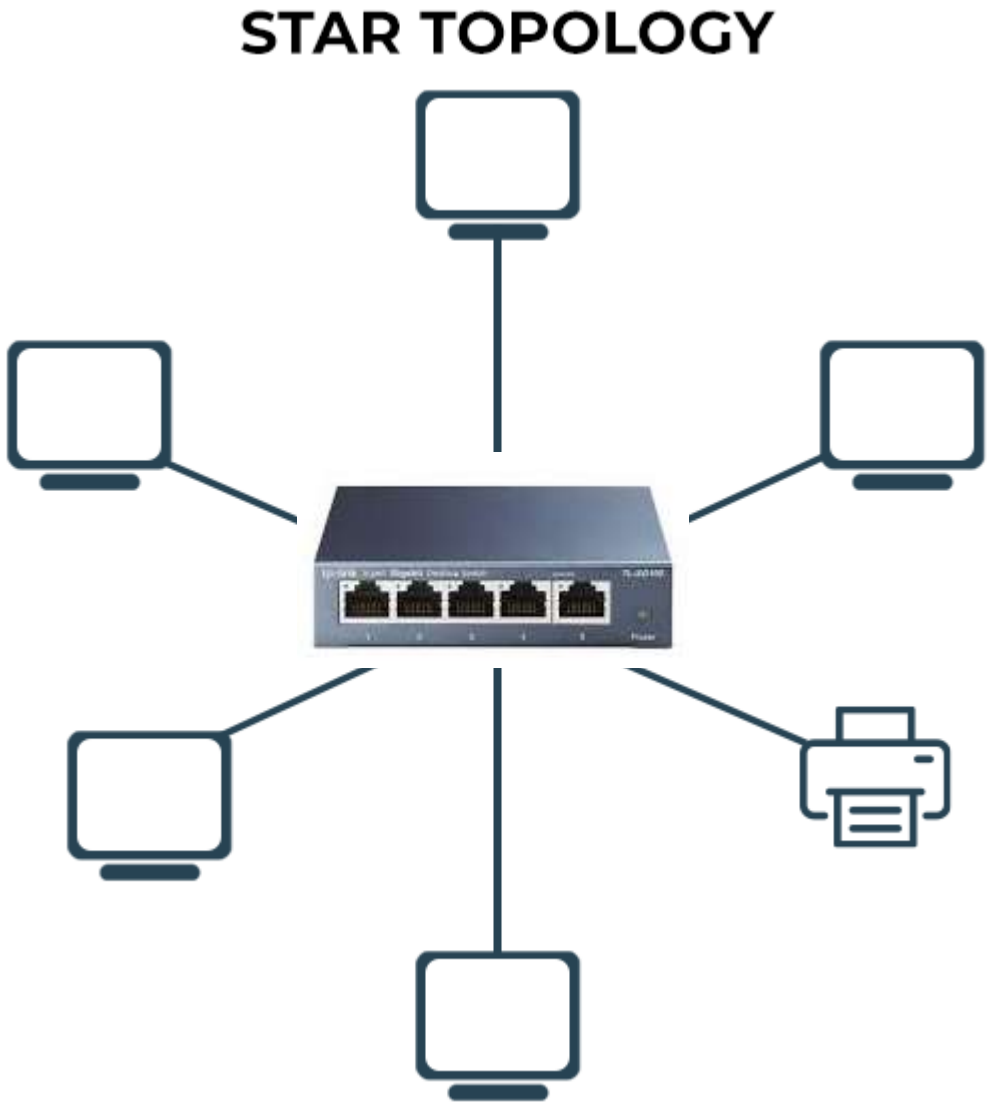
If the central bus cable fails, the entire network may become inoperative.

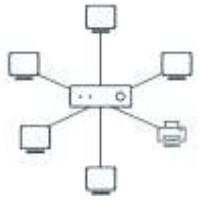
Collisions can occur when two devices attempt to transmit data simultaneously on the bus



Star topology

- It's **the most common** topology
- It this type of topology all devices are connected to a **central hub** or **switch**.
- Each device has a dedicated connection to the central hub, and the hub acts as a repeater, amplifying and sending the data to the appropriate device.
- **The hub** is a box containing several junctions to which it is possible to connect network cables from computers. Its role is to ensure communication between the different junctions.





Star topology

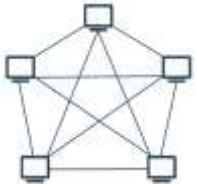
Star topology provides better reliability and performance compared to bus topology.

If one connection or device fails, it doesn't affect the rest of the network.

is easy to install, and adding or removing devices is straightforward. It is also easy to identify and troubleshoot network issues, as they often involve individual connections.

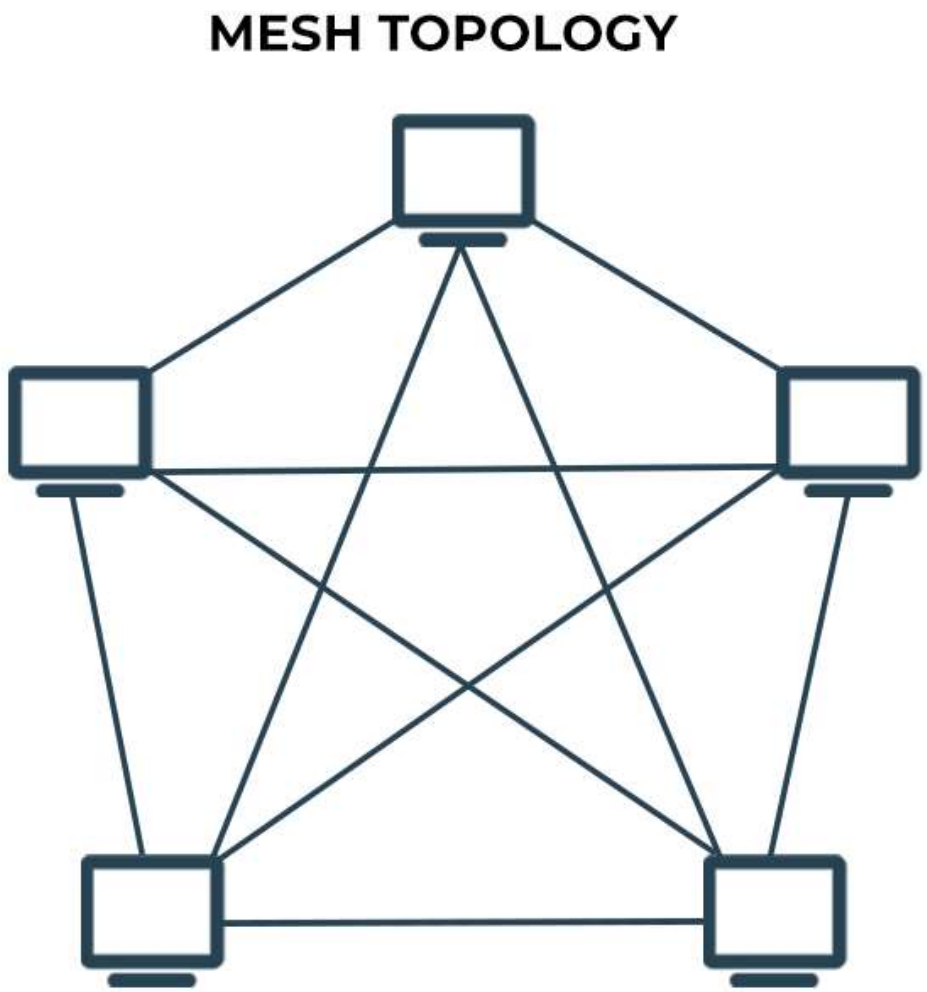
The central hub is a critical component in a star topology. If it fails, the entire network may be affected.

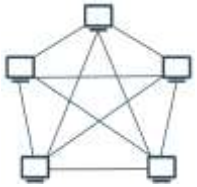
it may require more cabling than some other topologies, which can affect installation costs.



A mesh topology

- is a type of computer network topology where each device (node or point) is connected to every other device in the network.
- The information can travel through the network following various routes.
- Mesh networks are commonly used in various applications, including wireless communication, home automation, and industrial settings, where reliability and self-healing capabilities are essential.





Mesh topology

if one path or node fails, data can find an alternative route to reach its destination.

The number of connections required becomes very high when the number of terminals is high

Badji Mokhtar Annaba University
Faculty of Technology
Faculty of sciences

Information and Communication Technology (ICT)

Lecturer: Dr. CHEBLI Asma
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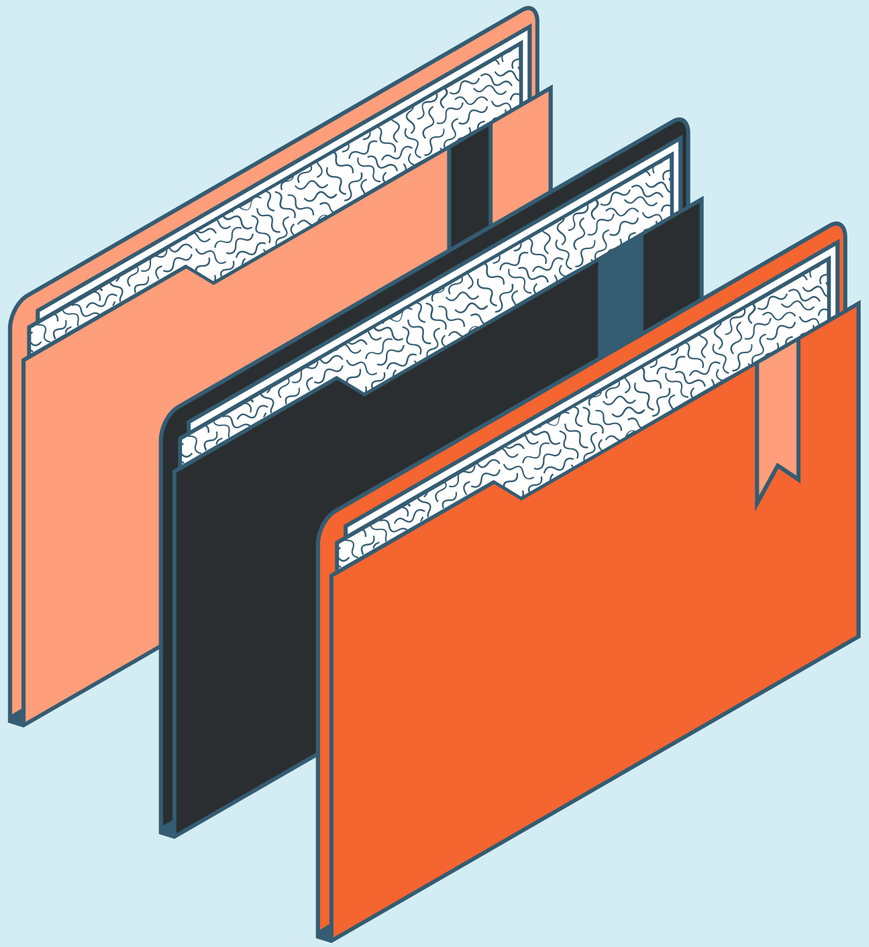


The communication spaces

What is a communication space?

A communication space refers to a virtual or physical environment where individuals or groups interact, exchange information, and share ideas.

It can take various forms, such as online platforms, social media networks, meeting rooms, or even informal gathering spots.

These spaces play a crucial role in facilitating communication, collaboration, and knowledge sharing among people

In the world of communication, there are different kinds of networks that help people connect and share information.

These are the internet, intranet, and extranet.

They each have their own special **uses and user**

Internet

A public network that is open to anyone owning a device that can access it.

Intranet

A private network that is locked and only accessible to people within a specific organization.

Extranet

A branch of a company's intranet that third-parties, like vendors or customers, have access to.

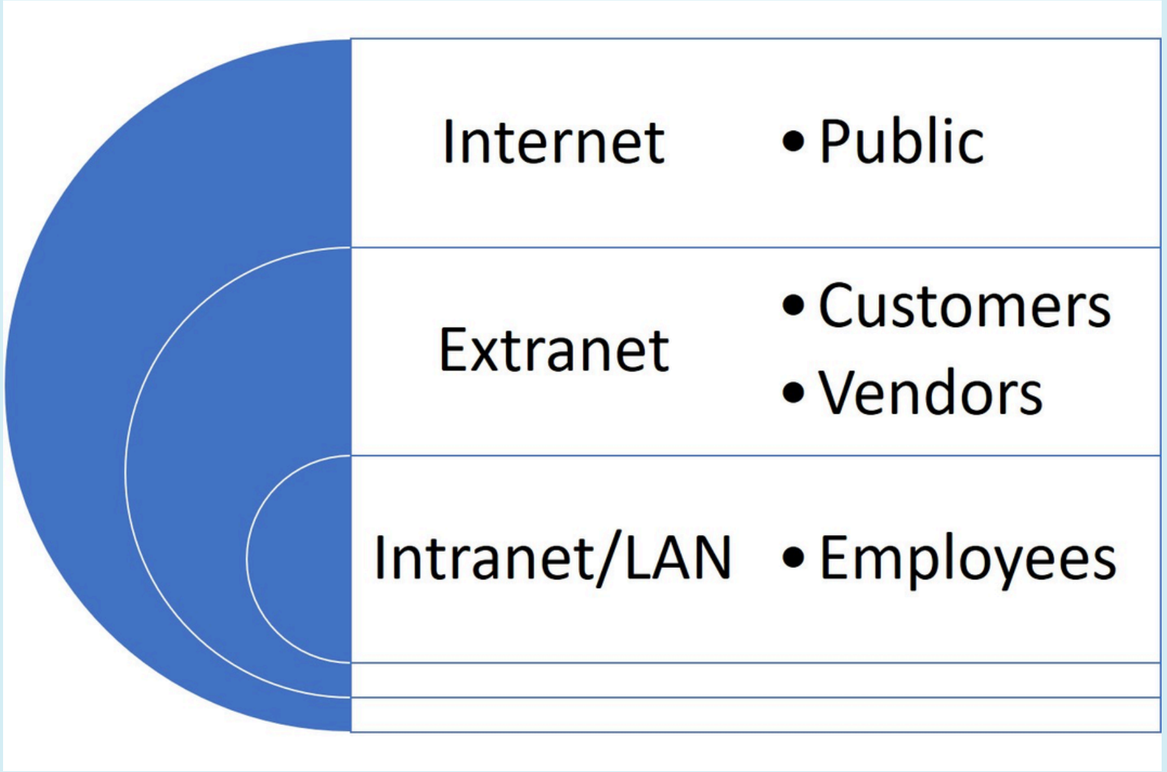
- **Internet:** "The internet is a global network of interconnected computers and servers, providing access to vast amounts of information and services on a global scale."

- **Intranet:** "In contrast, an intranet is a private network accessible only to members within a specific organization. It serves as a secure platform for internal communication, document sharing, and collaboration among employees."

- **Extranet:** "Finally, an extranet extends beyond the boundaries of an organization, allowing limited access to authorized external parties such as clients, suppliers, or partners. It facilitates secure communication and collaboration between different entities while maintaining controlled access to sensitive information."

Each of these three types of networks allows for a wide range of professional uses, but the type of information shared on each network determines its security requirements.

This means that you should only share **highly confidential information on your intranet**, while **less sensitive data can be shared on an extranet.**



Internet:

Internet is a network that connects computers to each other. It is composed of international, national, regional, etc., networks.

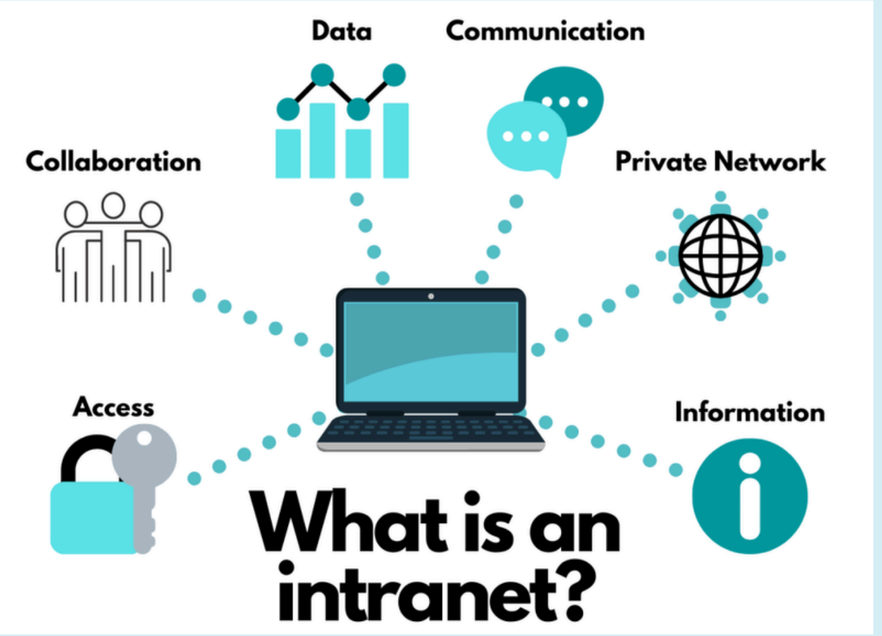
How does the Internet work?

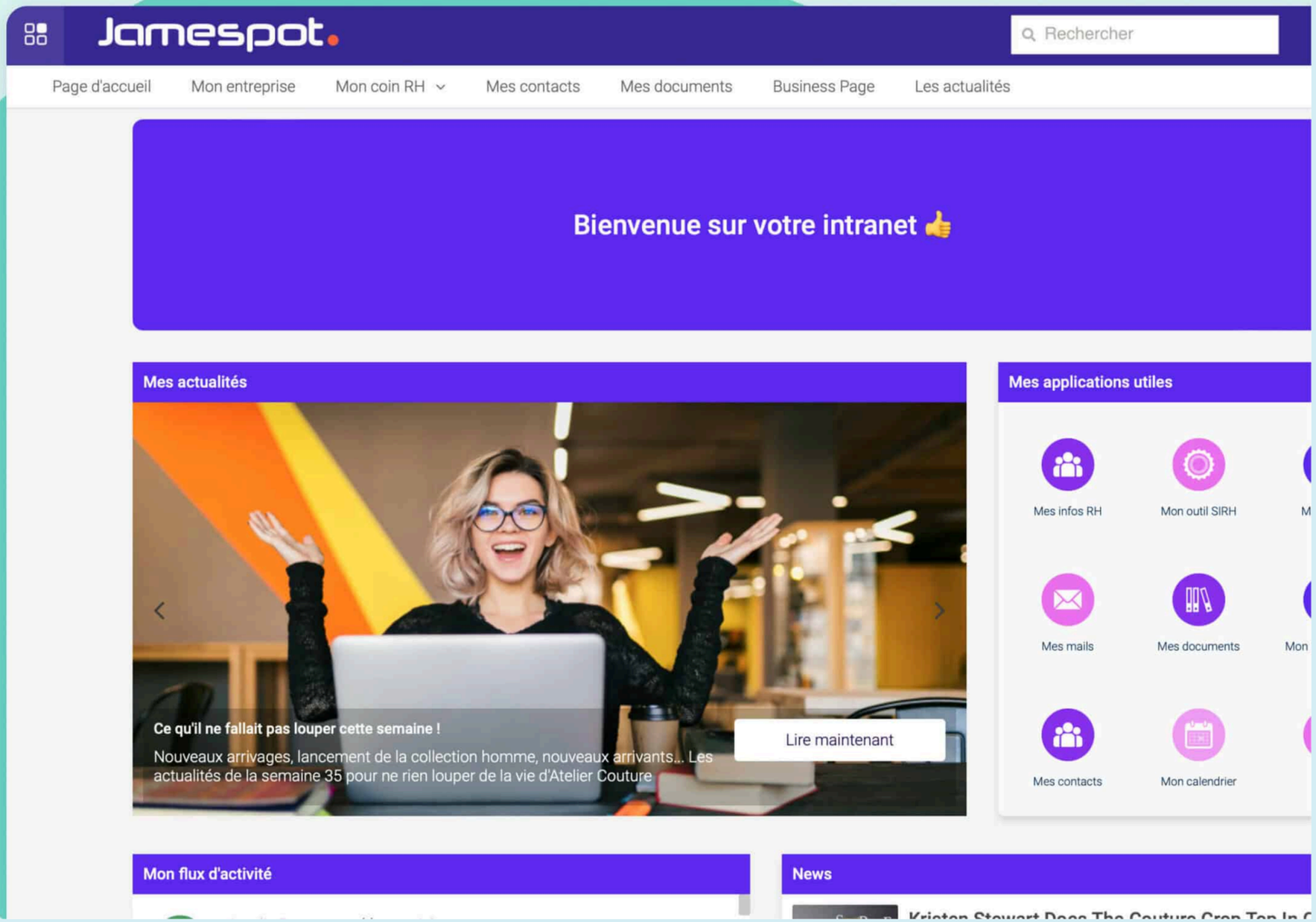
Similar to a telephone, each connected computer has an Internet number: the IP address, for example: 41.145.0.23.
Within the network, there are machines called "**routers**" that circulate information by directing it in the right direction based on the requested number.
The network can circulate various types of information: sound, video, images, text, emails, etc.

Intranet:

An internal computer network (within a company, organization, etc.) that uses Internet techniques.
An intranet is a network that operates like the Internet but has restricted access to a limited group of authorized users (such as employees of a company).

An intranet platform is the **internal version of a company's internet**.
It is software (or more precisely an online platform) .
It provides collaboration tools that promote internal communications.
Simply put, an intranet is a digital space that brings together all employees of a company and facilitates the sharing of information.

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Rechercher
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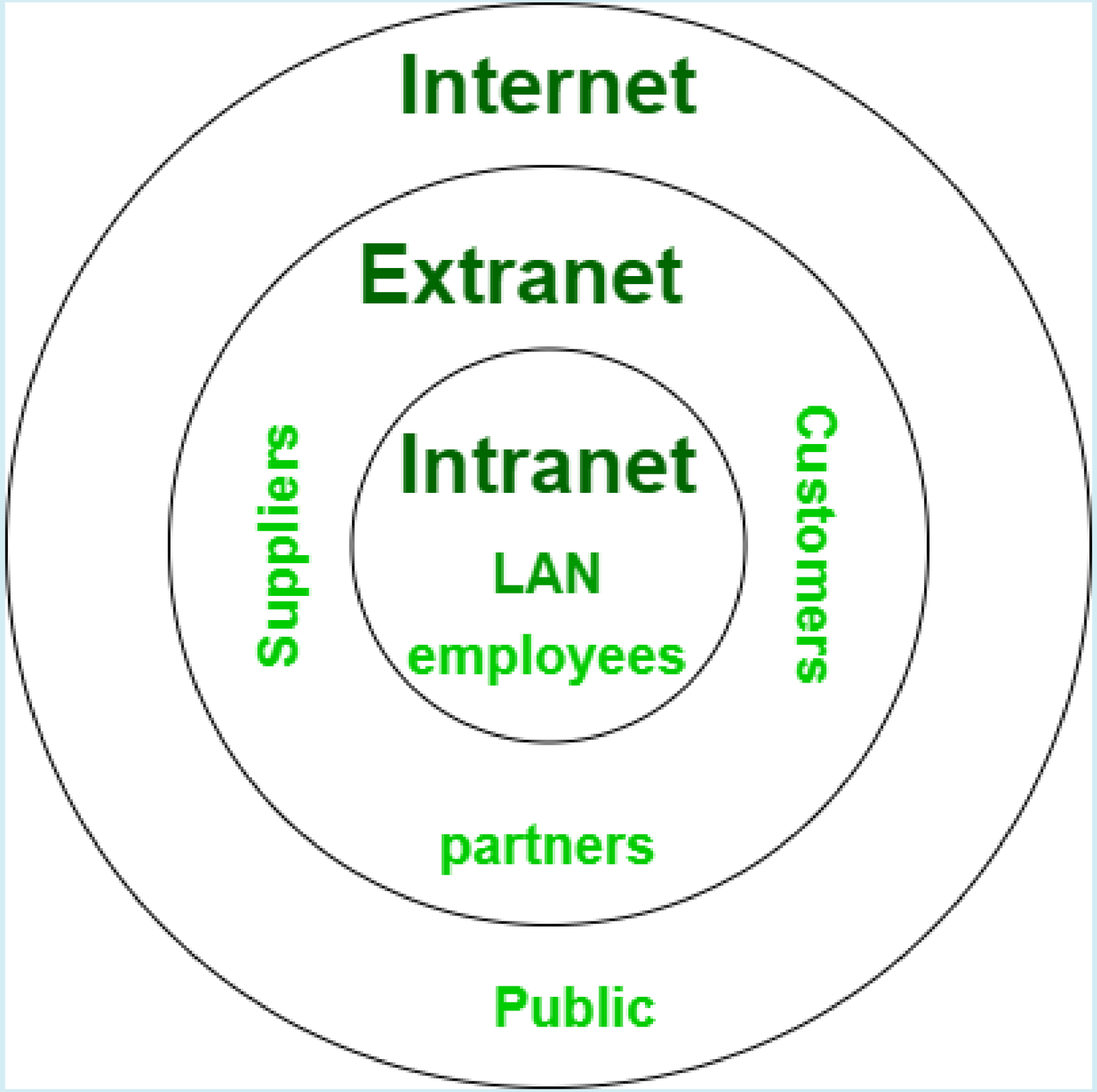
Mes contacts
Mes documents
Business Page
Les actualités
Bienvenue sur votre intranet 👍
Mes actualités
Ce qu'il ne fallait pas louper cette semaine !
Nouveaux arrivages, lancement de la collection homme, nouveaux arrivants... Les actualités de la semaine 35 pour ne rien louper de la vie d'Atelier Couture
Lire maintenant
Mes applications utiles
Mes infos RH
Mon outil SIRH
Mes mails
Mes documents
Mes contacts
Mon calendrier
Mon flux d'activité
News

Advantages of an intranet:

1. Allows employees to access all information remotely, ideal for telecommuting.
2. Facilitates social exchange of information.
3. Provides access to all company documents.
4. Maintains employee engagement and involvement.
5. Offers a pleasant, intuitive, and customizable user interface.

Extranet:

An extranet is the use of the internet network in which an organization structures this network to connect with its business partners ;
In contrast, an intranet network is limited to the internal network of the organization, without using third-party (public) infrastructure.
Extranet is a meansof sharing and collaborating with them. If you have a client who regularly places orders with your company, you can create a secure extranet that allows them to update their orders, process invoices, and send messages to your team.

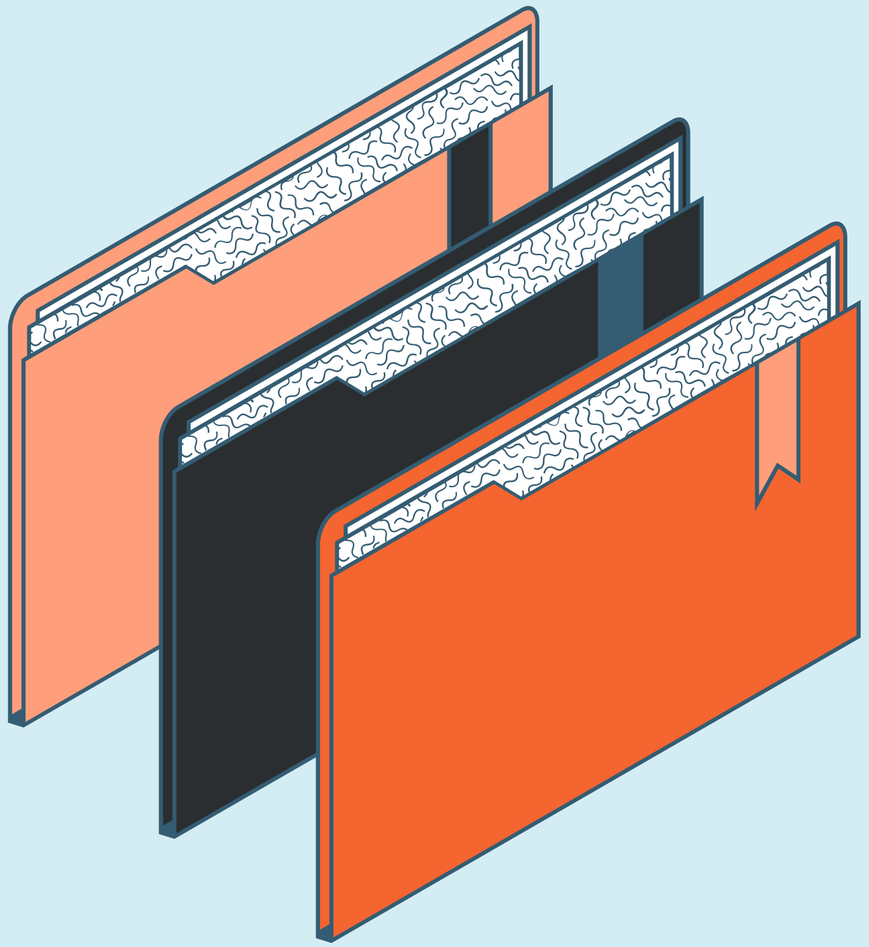

Internet
Extranet
Intranet
LAN
employees
Suppliers
Customers
partners
Public

Intranets and extranets are typically implemented within the framework of LANs and WANs:

Intranet: An intranet is a private network that is accessible only to an organization's internal users, typically implemented within the organization's **LAN**.

Extranet: An extranet is a private network that extends beyond an organization's internal network to include external users, such as customers, suppliers, or partners. Extranets are often implemented using WAN technologies to securely connect remote users to the organization's network.

So, while LAN, WAN, and MAN refer to the geographical scope of networks, internet, intranet, and extranet refer more to their **functional purpose and accessibility**.



Databases

While communication spaces focus on the interaction and exchange of information, databases serve as the backend infrastructure that supports these interactions by storing and managing the data involved

1.What is a database?

General Description:

It is difficult to give an exact definition of the concept of a database.
A very general definition could be:

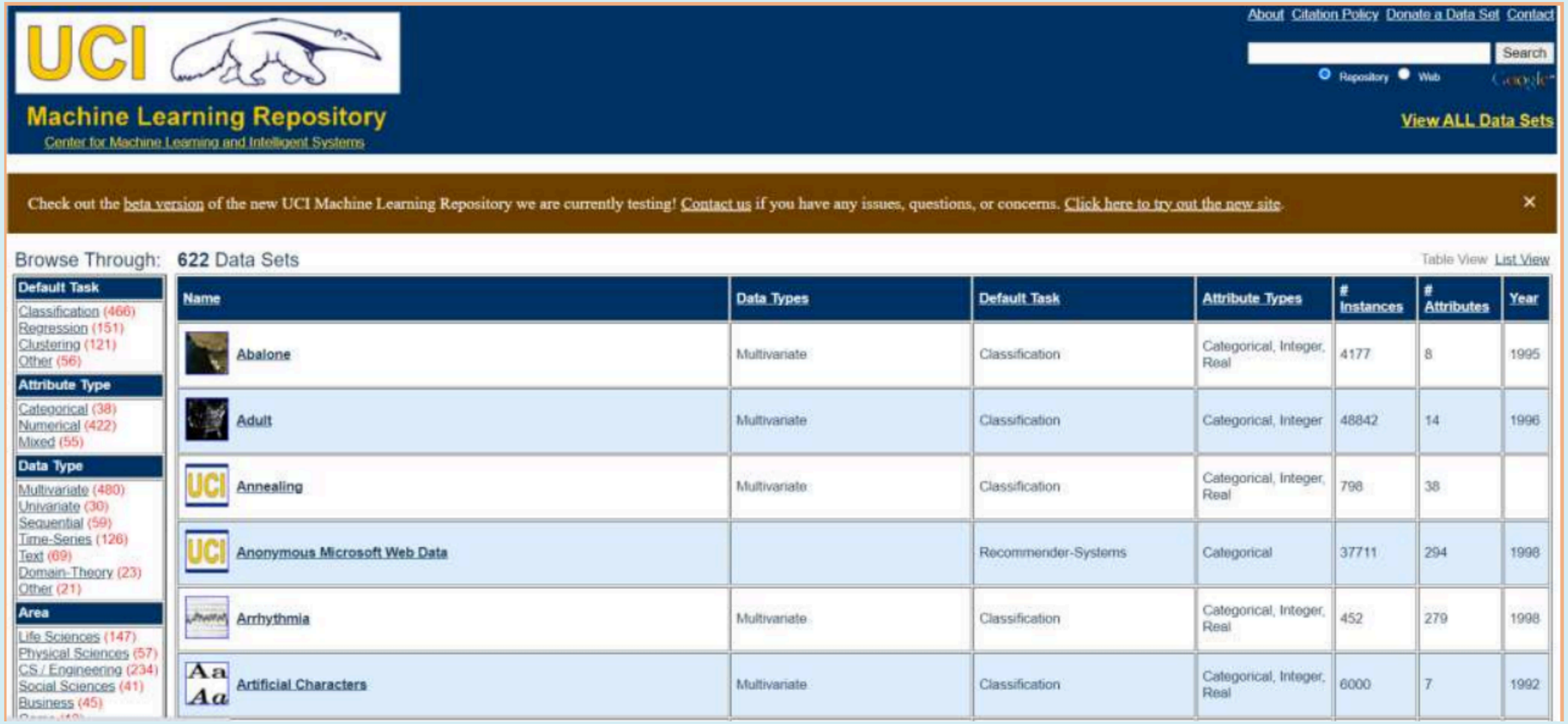
It is an organized set of information with a common objective. Regardless of the medium used to gather and store the data (paper, files, etc.), as long as data is collected and stored in an organized manner for a specific purpose, it is considered a database.

More specifically, a database is a structured and organized set allowing the storage of large amounts of information to facilitate its exploitation (adding, updating, searching for data).

In this course, we are interested in computerized databases.

Computerized Database:

A computerized database is a structured collection of data stored on computer-accessible media, representing real-world information that can be queried and updated by a community of users.



2.How a Database Works:

- A database is stored as a file or set of files on a storage medium.
- The information in these files can be divided into records.
- A record usually contains multiple pieces of information (entries) related to the same object.
- For example, a record in a file containing a description of a company's clients will contain several pieces of information (fields) about a client: their client number, name, postal address, phone number, etc.

In a customer database, each record represents a customer and contains various details like their ID number, name, address, and phone number. These records are organized into tables, with columns representing different information fields. Using search and sorting commands, users can quickly find specific customer data or create reports based on different criteria.

3.Types of databases

Databases are structured collections of data that allow for efficient **storage, retrieval, and management of information**. There are various types of databases, each designed to cater to specific needs and use cases. Here's a brief overview of some common types:

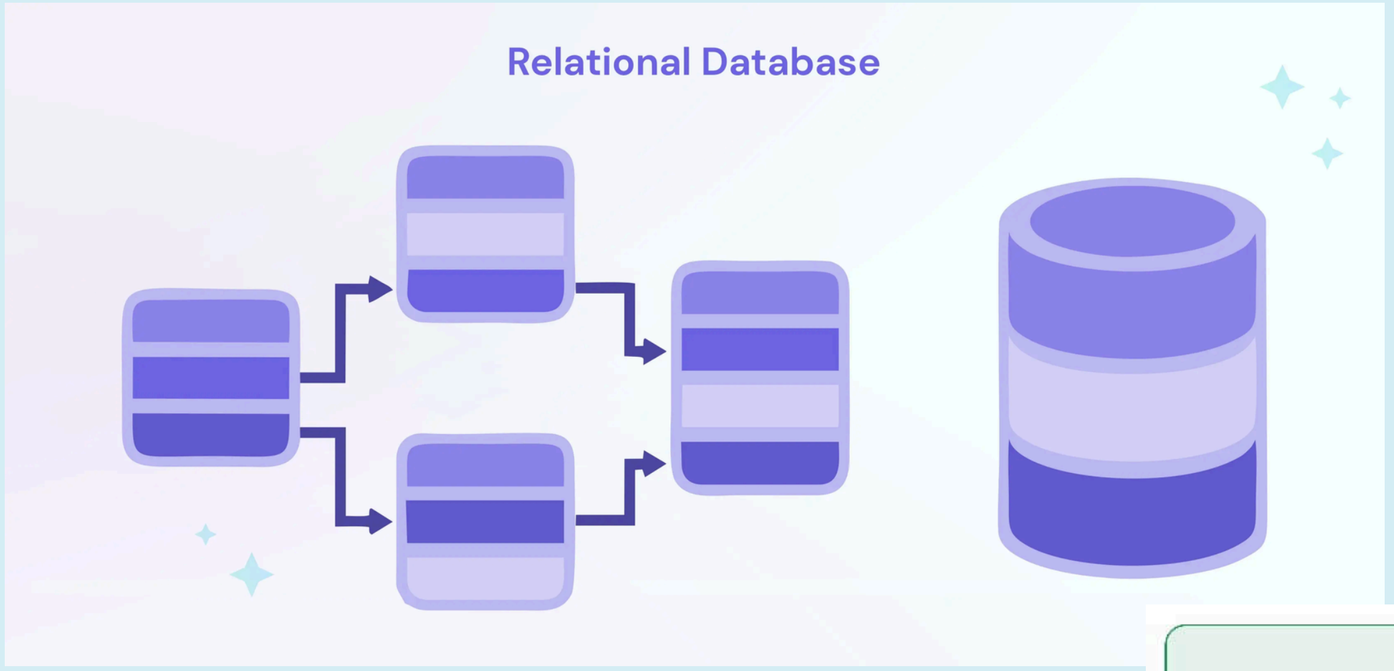
- **Relational Databases:**

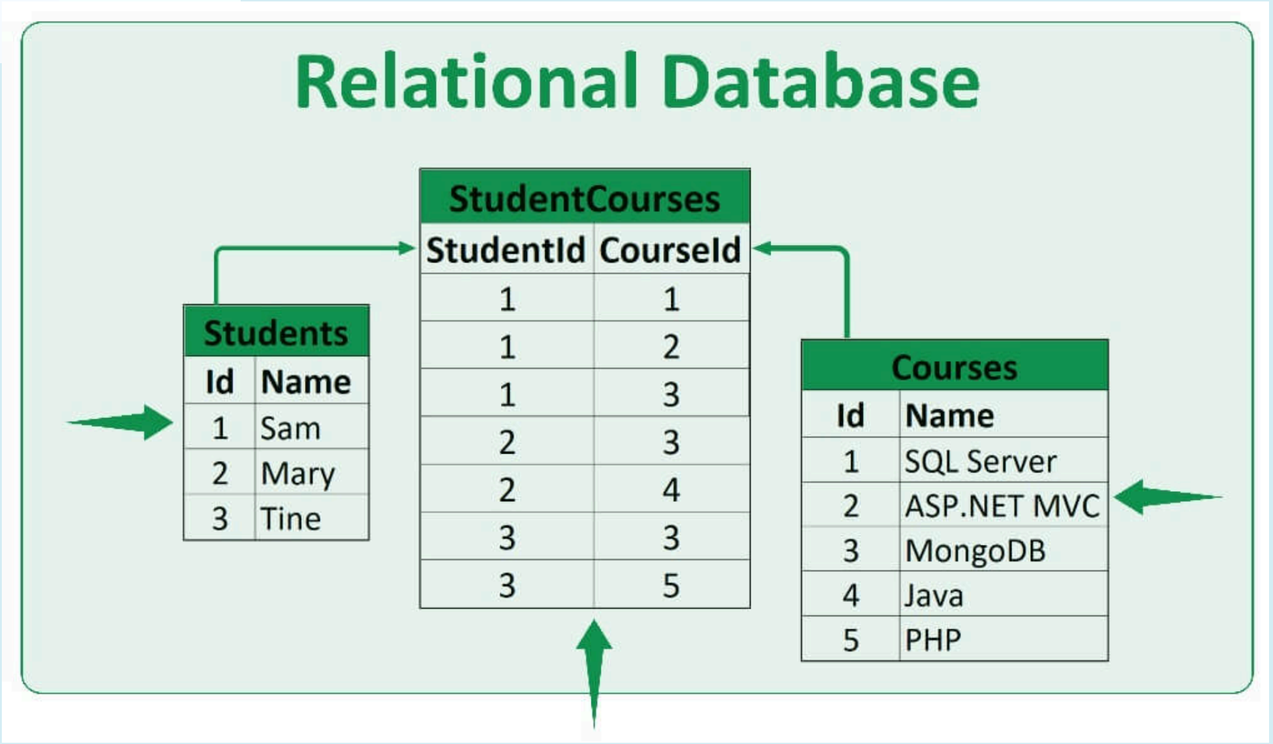
Description: Relational databases organize data into tables with rows and columns, and they use structured query language (SQL) for data manipulation.

Example: MySQL, Microsoft SQL Server.

Use Cases:

1. E-commerce: Storing product catalogs, customer information, and order details.
2. Banking: Managing account balances, transaction histories, and customer profiles.


Relational Database


Relational Database
StudentCourses
StudentId CourseId
1 1
1 2
1 3
2 3
2 4
3 3
3 5
Students
Id Name
1 Sam
2 Mary
3 Tine
Courses
Id Name
1 SQL Server
2 ASP.NET MVC
3 MongoDB
4 Java
5 PHP

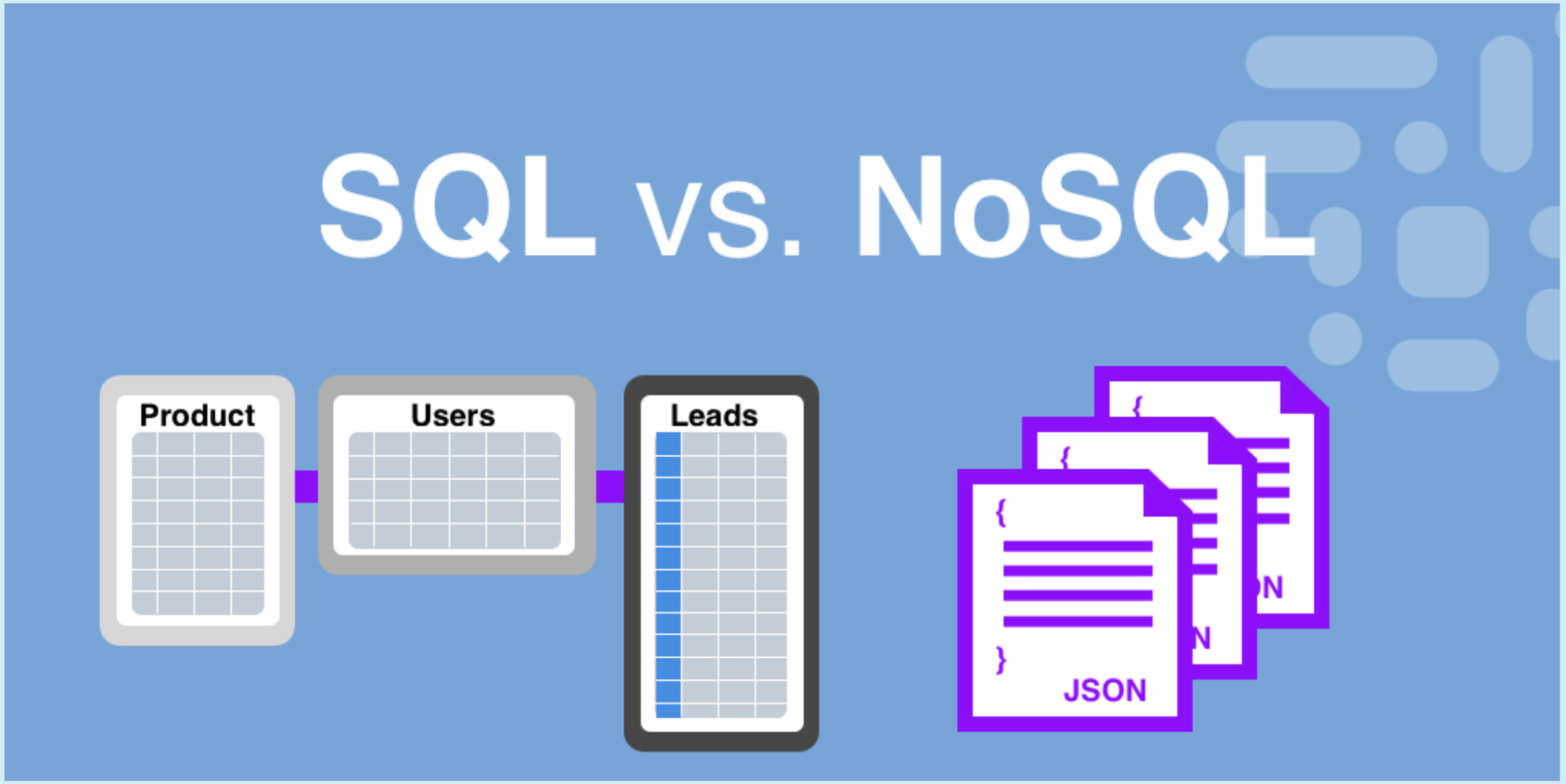
- **NoSQL Databases:**

Description: NoSQL databases are non-relational and provide a flexible schema design, scalability, and high performance for handling large volumes data.

Example: MongoDB

Use Cases:

1. Social media: Storing user profiles, posts, comments, and social connections.
2. Big data analytics: Processing and analyzing large datasets from various sources in real-time.


SQL vs. NoSQL
Product
Users
Leads
{
}
JSON

- **Object-Oriented Databases:**

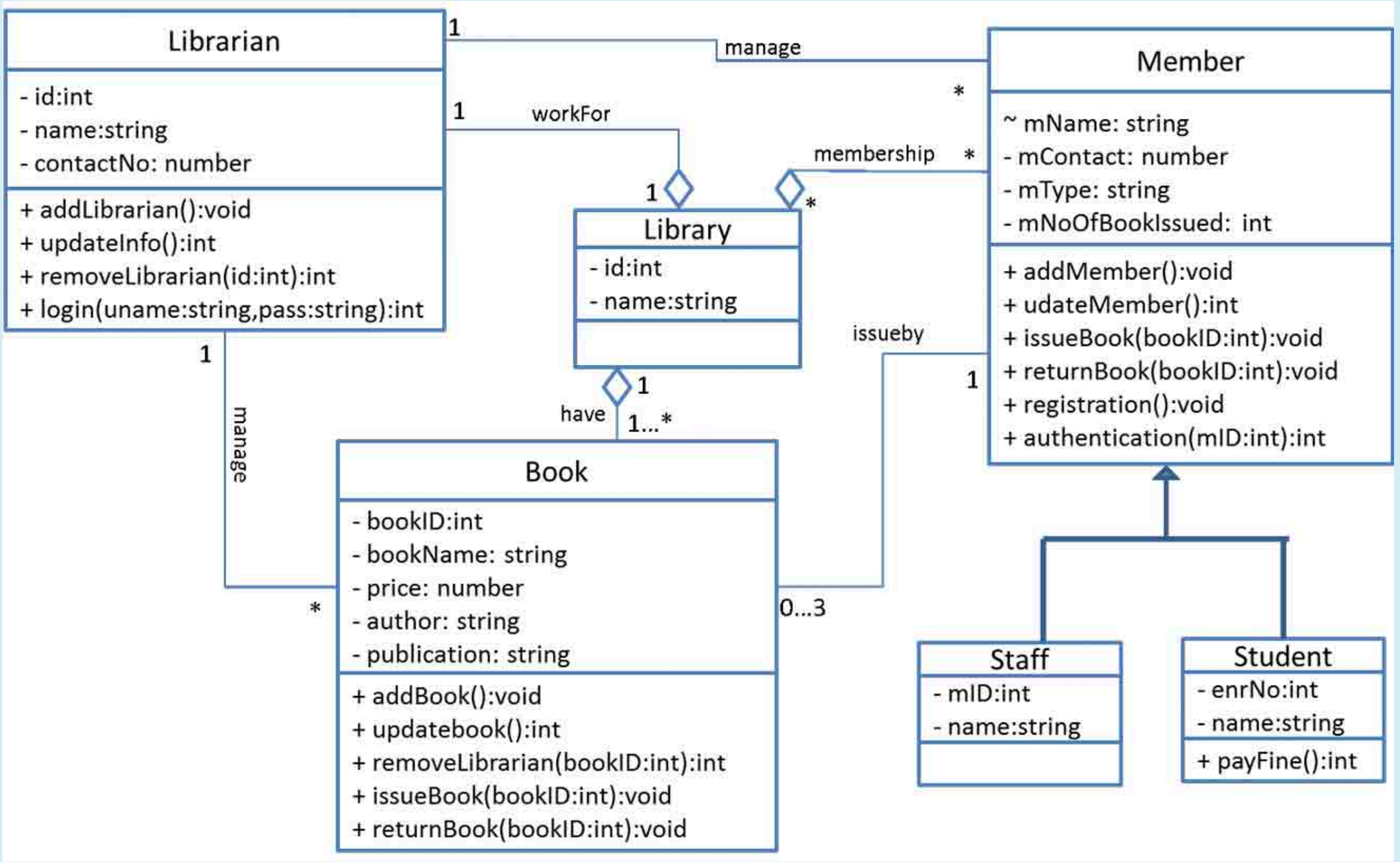
Description: store data in the form of objects, like in object-oriented programming. Each object has data (attributes) and actions it can perform (methods). They're great for complex data structures, but not as common as relational databases.

Example: db4o, ObjectDB

Library management system

In an object-oriented database:

Book Object: Each book is represented as an object. It has attributes like title, author, and publication date. Methods could include borrowing the book, returning it, or updating its information.
User Object: Users who borrow books are also represented as objects. These objects might have attributes such as name, address, and membership status. Methods could include borrowing history or updating contact information.
Transaction Object: When a user borrows a book, a transaction object is created to record the details, such as the book borrowed, the user who borrowed it, and the date of borrowing.

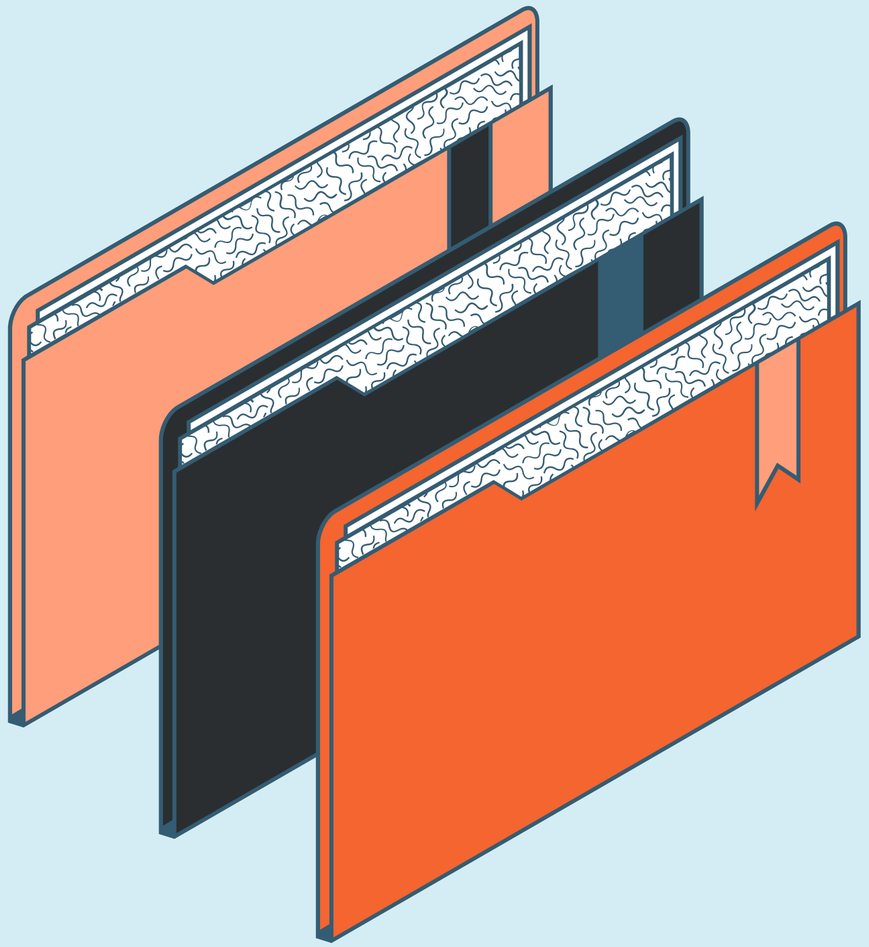

Librarian
- id:int
- name:string
- contactNo: number
+ addLibrarian():void
+ updateInfo():int
+ removeLibrarian(id:int):int
+ login(uname:string,pass:string):int
1
manage
1
workFor
1
manage
*
Member
~ mName: string
- mContact: number
- mType: string
- mNoOfBookIssued: int
+ addMember():void
+ udateMember():int
+ issueBook(bookID:int):void
+ returnBook(bookID:int):void
+ registration():void
+ authentication(mID:int):int
membership
*
*
1
Library
- id:int
- name:string
1
have
1...*
issueby
1
*
Book
- bookID:int
- bookName: string
- price: number
- author: string
- publication: string
+ addBook():void
+ updatebook():int
+ removeLibrarian(bookID:int):int
+ issueBook(bookID:int):void
+ returnBook(bookID:int):void
0...3
Staff
- mID:int
- name:string
Student
- enrNo:int
- name:string
+ payFine():int

Each type of database has its strengths and weaknesses, and the choice depends on factors such as the nature of the data, scalability requirements, and performance considerations.

Understanding the differences between these types is essential for designing effective data storage solutions.

Why are databases essential in Information and Communication Technology (ICT)?

Databases in ICT store and manage information crucial for applications like social media (e.g., Facebook), search engines (e.g., Google), and e-commerce (e.g., Amazon). They enable efficient information retrieval, support communication systems (e.g., email), and aid decision-making by analyzing data patterns and user behavior.



Multimedia in ICT

Multimedia in Information and Communication Technology (ICT)

Multimedia refers to the integration of various forms of media such as text, audio, images, video, and animation.

In ICT, multimedia plays a crucial role in enhancing communication and information exchange.

1. Audioconferencing

Definition: Audioconferencing enables real-time communication between multiple participants through audio channels over the internet or telecommunication networks.

Features: Allows remote collaboration and meetings without physical presence.
Supports voice-only communication, facilitating discussions, presentations, and decision-making.

Example: Use of audioconferencing tools like Zoom, Skype, or Microsoft Teams for virtual meetings, training sessions, and client consultations.

2.Videoconferencing

Definition: Videoconferencing enables real-time communication between participants using audio and video streams over the internet or telecommunication networks.

Features:

Combines audio and visual elements, providing a richer communication experience.
Supports face-to-face interactions, body language, and visual aids, enhancing engagement and understanding.

Example: Use of videoconferencing platforms like Zoom, Google Meet, or WebEx for virtual meetings, webinars, interviews, and online classes.

Importance of Multimedia in ICT

- Enables Remote Collaboration: Audioconferencing and videoconferencing enable remote collaboration and teamwork, overcoming geographical barriers and increasing productivity.

- Supports Rich Content Delivery: Multimedia enables the creation and delivery of engaging content, such as interactive presentations, training videos, and multimedia tutorials, enhancing user engagement and retention.

Multimedia technologies like audioconferencing and videoconferencing are integral components of ICT, empowering individuals and organizations to communicate, collaborate, and share information effectively in today's digital world.