



# PTIK

## (Pengantar Teknologi Informasi dan Komunikasi)

Arranged by :

Ammar Hawari (II23094000003)

Muhammad Amar Primus Firdaus (II230940000067)

# TOPIC

The benefits of distributed computing and examples of distributed computing applications in health, security, broadcast networks and peer to peer networks.





What is the definition of  
distributed computing  
and its benefits



# *Definition of distributed computing and its benefits*

## Definition

In computer science, distributed computing studies the coordinated use of physically separate or distributed computers. Distributed systems require different software than centralized systems. With the aim of bringing together the capabilities of physically separated resources (computing resources or information resources), into a coordinated, combined system.

Source : [https://en.wikipedia.org/wiki/Distributed\\_computing](https://en.wikipedia.org/wiki/Distributed_computing)

Distributed computing systems can be scalable, allowing for the addition of new components to the system when needed. They are not prone to failure if one computer is damaged, as they can continue functioning even if the other computer fails. They maintain data consistency, allowing for better data analysis without relying on individual data consistency. They also provide transparency, allowing users to interact with the system without needing to know individual settings or configuration.

## Benefits

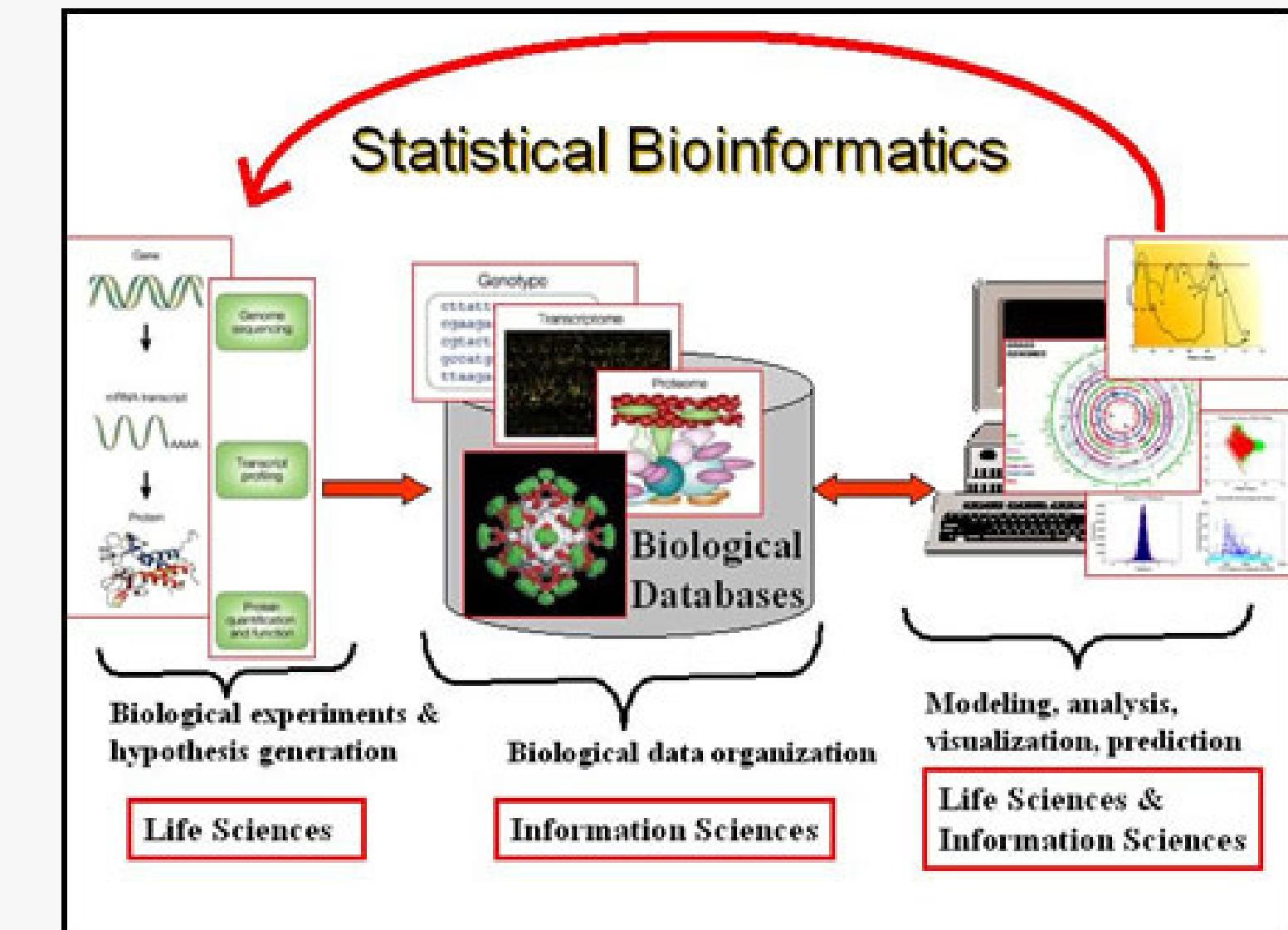


*Examples of distributed computing  
applications in health  
and security*

# GENOMIC DATA ANALYSIS

Bioinformatics generally means the use of computational methods to study biological data. Specifically, it means the development of computational methods to study the structure, function and evolution of genes, proteins and the entire genome of an organism. Bioinformatics incorporates various information technologies that will accelerate the calculation and classification of vast amounts of gene data for biologists to analyze and interpret.

( Source : [https://www.stat.purdue.edu/sbc/statistical\\_bioinformatics.html](https://www.stat.purdue.edu/sbc/statistical_bioinformatics.html) )



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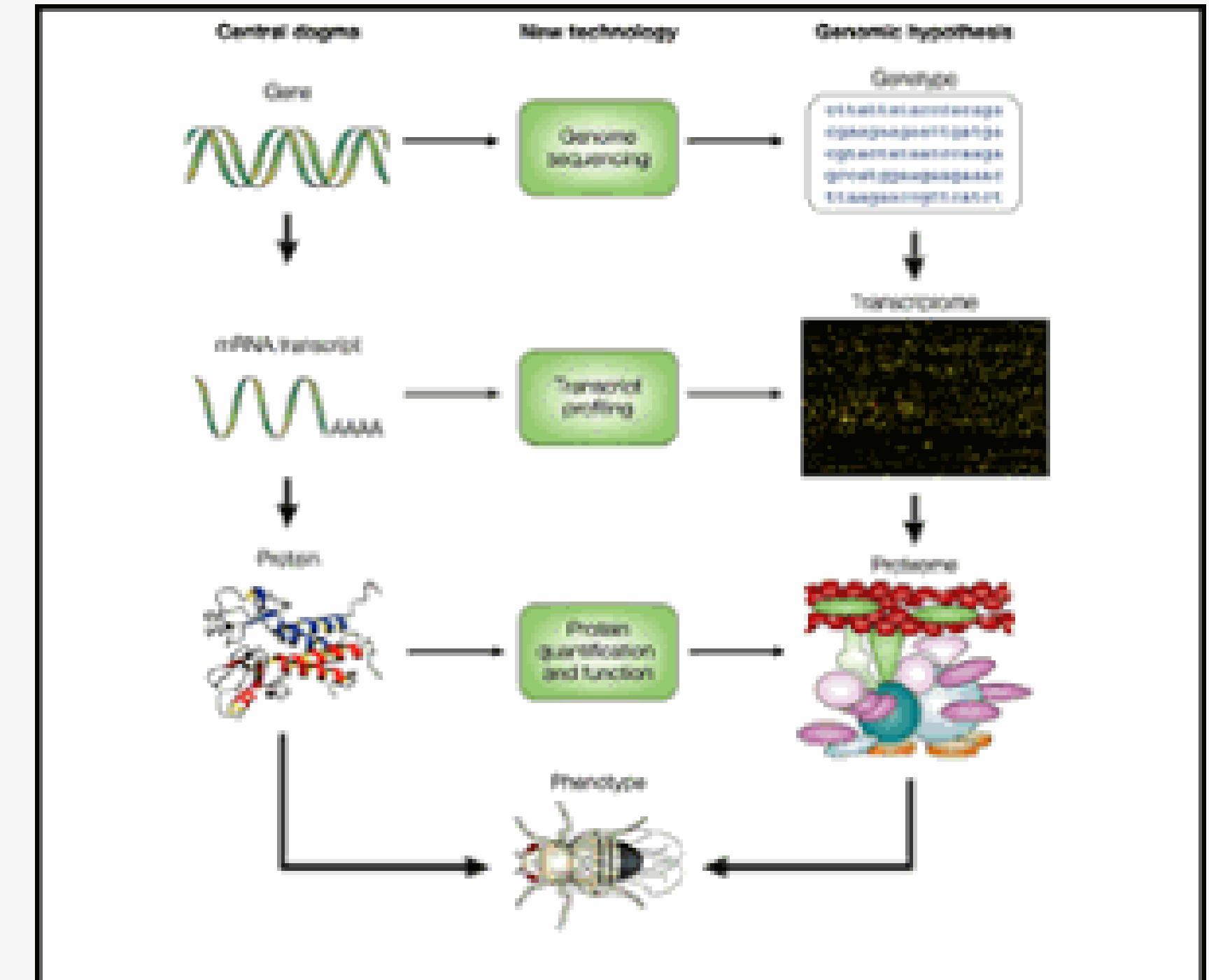
# GENOMIC DATA ANALYSIS

**First Column :** The Central Dogma is central to biological investigations, involving the transcription of genes and translation into proteins, which directly impact organisms. Understanding these interrelated connections is a significant biological mystery.

**Second Column :** DNA sequencing has enabled the complete sequencing of many genomes, including the human genome, allowing the identification of every gene. However, understanding the function of every gene remains challenging. New technologies like transcript profiling and protein microarrays provide insights into gene mechanisms, while proteomics aims to establish strong links between protein-encoding genes and phenotypes.

**Third Column :** New technologies enable genomic hypotheses at each stage of the Central Dogma, providing limited information but connecting stages. Statistical Bioinformatics can gather data from individual sources for a single analysis, enabling gene networks and phenotypic results.

( Source : [https://www.stat.purdue.edu/sbc/statistical\\_bioinformatics.html](https://www.stat.purdue.edu/sbc/statistical_bioinformatics.html) )

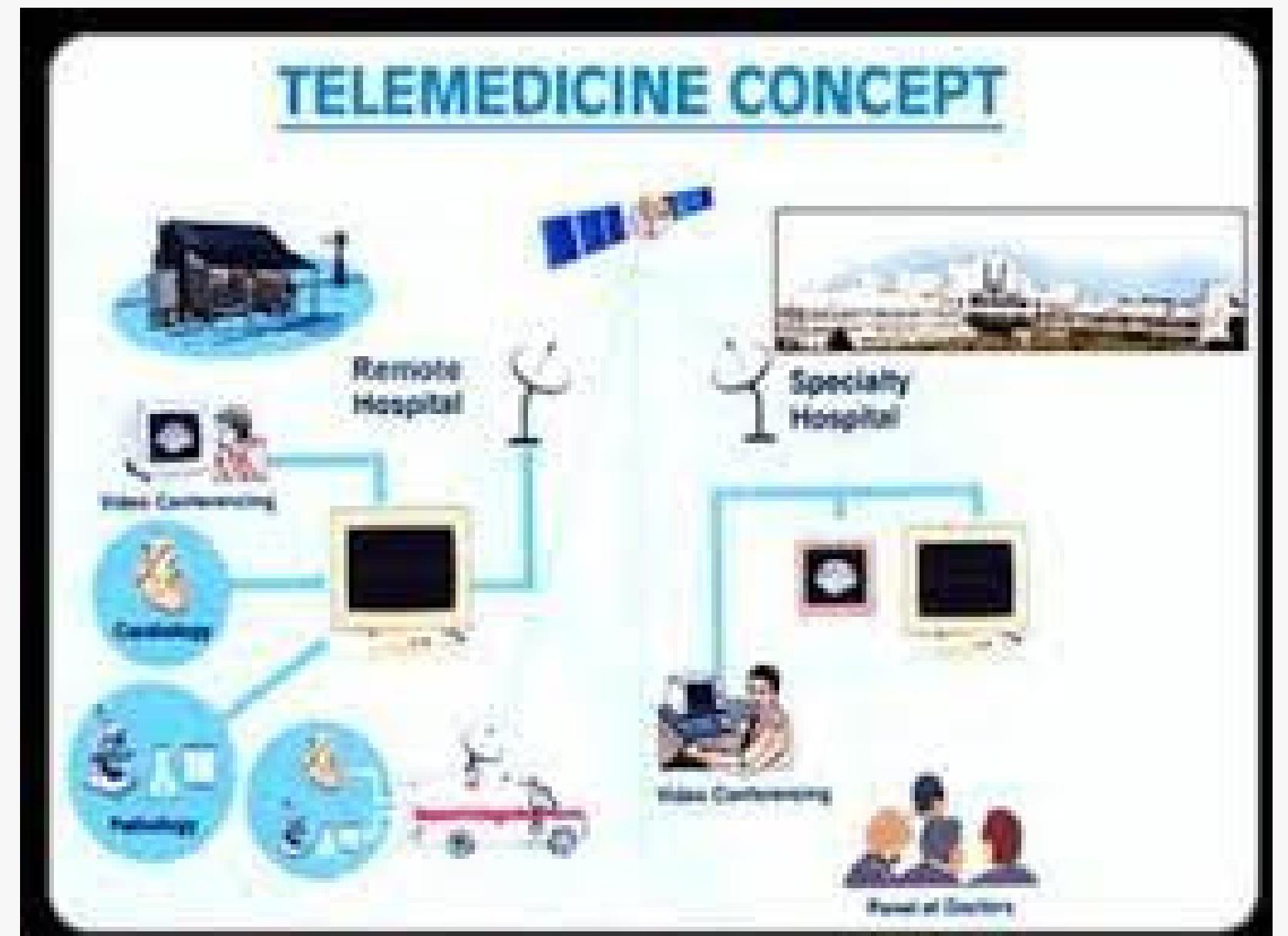


( Source : [https://www.stat.purdue.edu/sbc/statistical\\_bioinformatics.html](https://www.stat.purdue.edu/sbc/statistical_bioinformatics.html) )

# TELEMEDICINE

**In general,** telemedicine is the use of information and communication technology combined with medical expertise to provide health services, ranging from consultation, diagnosis and medical action, without space limitations or carried out remotely. To be able to run properly, this system requires communication technology that allows data transfer in the form of video, sound, and images interactively carried out in real time by integrating it into video-conference support technology. The development of telemedicine technology in analyzing medical images is increasing day by day due to advances in the fields of multimedia, imaging, computers, information systems and telecommunications. Telemedicine uses information and communication technology to provide health services remotely, including consultation, diagnosis, and medical action. It requires real-time data transfer through video, sound, and images. Advances in multimedia, imaging, computers, information systems, and telecommunications are driving the development of telemedicine technology. Computer networks, including the internet, connect computers in different buildings, cities, and the world, enabling synchronous and asynchronous communication.

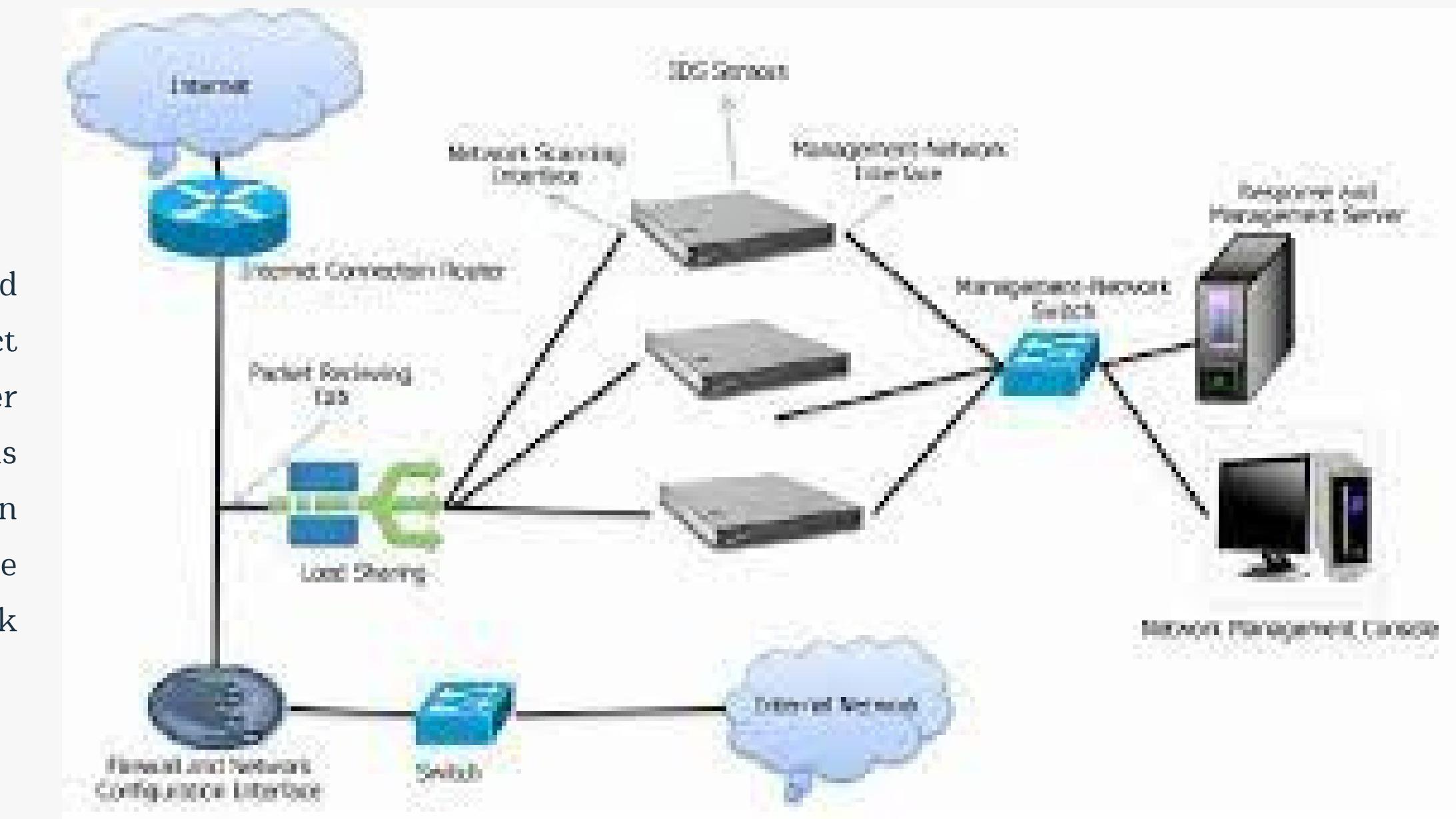
( Source : <https://bit.ly/408j573> Page 8 )



( Source : <https://bit.ly/3twTatq> )

# DISTRIBUTED INTRUSION DETECTION SYSTEMS

**Distributed Intrusion Detection Systems:** Distributed Intrusion Detection Systems are used to monitor and detect suspicious activity on computer networks. They use a number of sensors distributed across the network to collect data. This data is then sent to a centralized control center or analyzed in a distributed manner. This helps detect cyber threats more effectively as it can monitor multiple points in the network simultaneously.



( Source : <https://bit.ly/48NLDGF> )



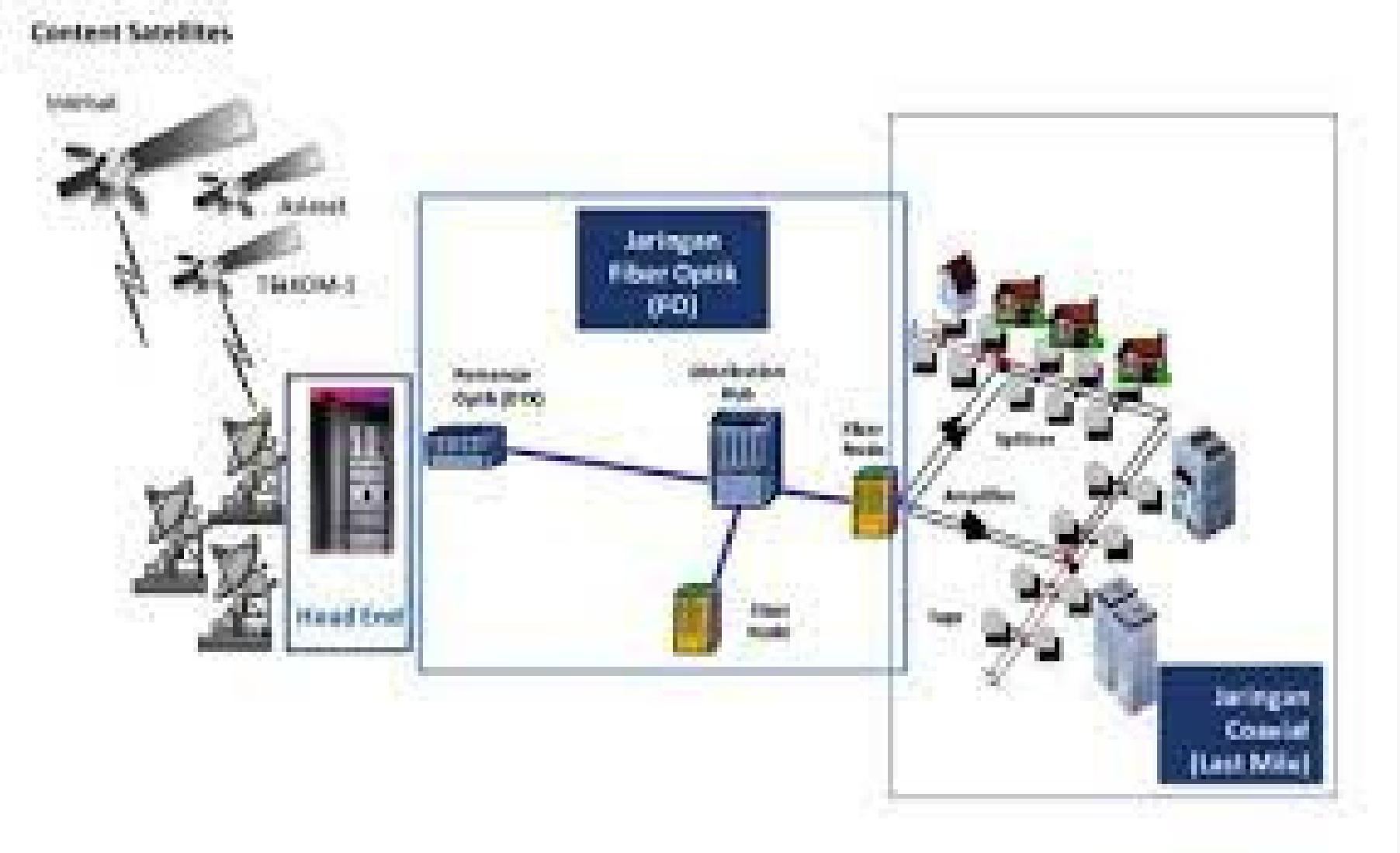
*Example of application of  
broadcast network and  
peer to peer network?*



# BROADCAST NETWORK

**Broadcast network** is a type of network where one device (or data center) sends data to all other devices in the network. An example application is in cable or satellite television networks, where television stations send television broadcasts to all their subscribers. Each subscriber can receive and display the same broadcast. Similarly, in computer networks, broadcast protocols are used primarily to send messages to all devices in the network. A television broadcasting network via cable or satellite television is a system that allows television stations to transmit television broadcasts to all their subscribers by using cable infrastructure or satellite signals. For example, when a computer sends a DHCP request for an IP address, the request is broadcast to the entire network, and available DHCP servers respond.

( Source : <https://bit.ly/3twWJji> )



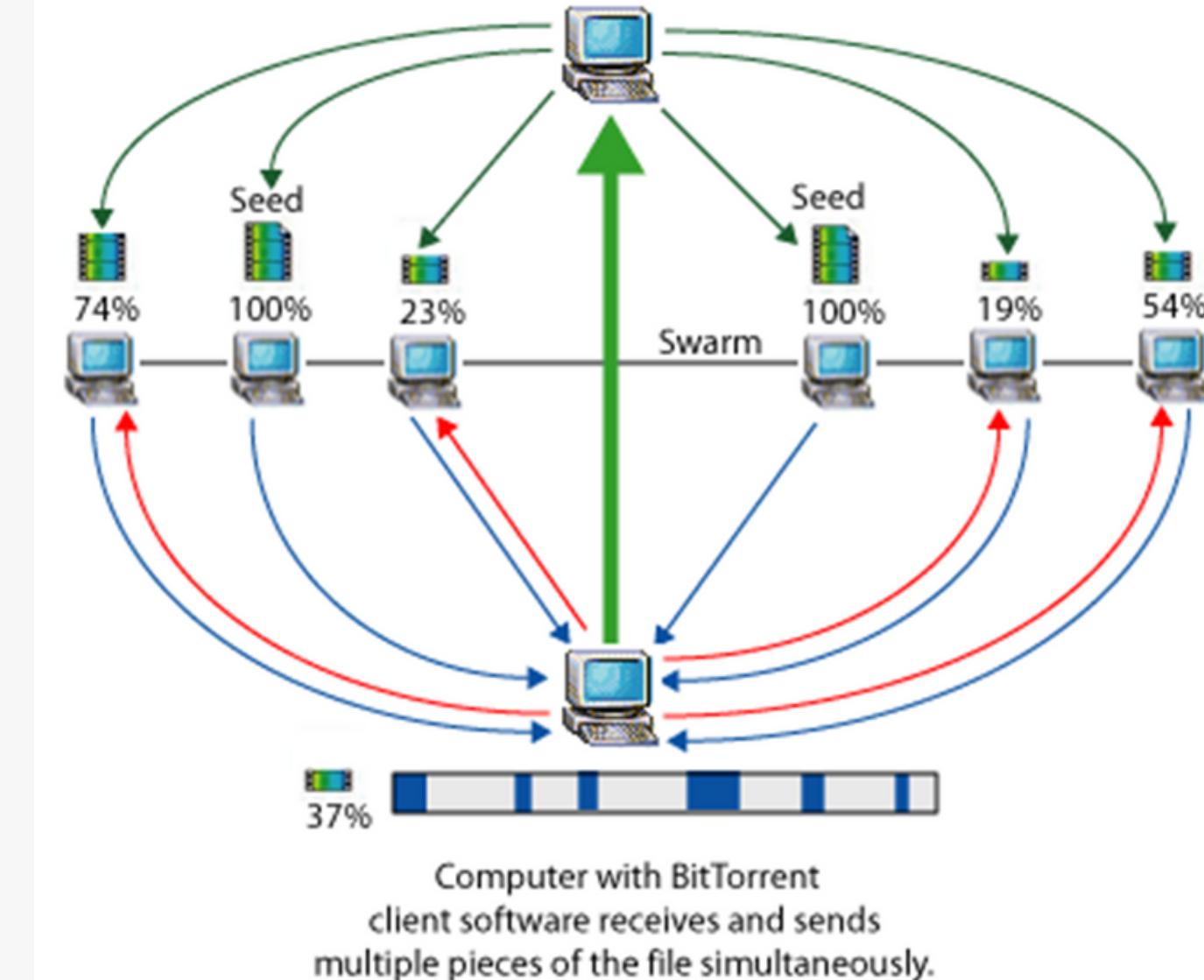
( Source : <https://bit.ly/3twWJji> )

# PEER TO PEER NETWORK

A **peer-to-peer network** is a network where devices (usually computers) connect directly to each other without any central device or server. This allows devices in the network to share resources, such as files, printers, or internet connections, directly. An example of its application is in torrenting networks. How Bit Torrent works starts from grouping a file into small pieces, someone who starts sharing the file or with the term initial seed sends small pieces to peers available in the swarm. BitTorrent protocol ensures that the seed sends unique pieces to everyone. So they can exchange pieces with everyone. So the more seeders and peers the faster the download speed will be.

( Source : <https://bit.ly/3Qdp0Jn> )

BitTorrent tracker identifies the swarm and helps the client software trade pieces of the file you want with other computers.



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( Source : <https://bit.ly/3Qdp0Jn> )

**THANK YOU**

