University of Asia Pacific

Department of Computer Science & Engineering

Computer Networks Lab

CSE 320

Topology design and Report

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Topology:

Topology is a branch of mathematics that studies the properties of objects that are preserved under continuous transformations. In topology, we are interested in understanding the properties of objects that remain unchanged even when the objects are stretched, bent, twisted, or deformed, as long as these transformations are continuous.

The objects studied in topology are called topological spaces, which are sets equipped with a certain structure that allows us to talk about concepts such as continuity, convergence, connectedness, and compactness. The basic objects in topology are points, open sets, and continuous functions, which are used to define the properties of topological spaces and the relationships between them.

Topology has many applications in various fields such as physics, computer science, engineering, and economics. For example, in physics, topology is used to describe the properties of objects such as knots, while in computer science, it is used to study the properties of networks and algorithms.

Topology Fundamental:

Topological space: A topological space is a set of points with a topology, which is a collection of subsets that satisfy certain axioms, such as being closed under arbitrary unions and finite intersections.

Open and closed sets: In a topological space, a subset is called open if it belongs to the topology, and closed if its complement is open. Open sets are used to define the concept of continuity in topology.

Continuity: A function between two topological spaces is continuous if the inverse image of every open set is open.

Homeomorphism: A homeomorphism is a bijective continuous function between two topological spaces, with a continuous inverse. Homeomorphic spaces have the same topological properties.

Compactness: A topological space is compact if every open cover has a finite subcover. This means that it is not possible to cover the space with an infinite number of open sets.

Connectedness: A topological space is connected if it cannot be divided into two nonempty disjoint open sets. Connected spaces are those that cannot be separated into disconnected pieces.

Separation axioms: Separation axioms are a set of properties that impose conditions on how topological spaces can be separated by open or closed sets. Examples of separation axioms include Hausdorff, regular, and normal spaces.

Topology States:

Topology states are a concept in condensed matter physics that describe the electronic properties of certain materials. In a topological state, the electronic band structure of a material has nontrivial topology, meaning that the properties of the material cannot be described solely by the local properties of individual atoms or molecules.

One example of a topological state is the quantum Hall effect, which occurs in a two-dimensional electron gas subjected to a strong magnetic field. In this state, the electronic conductivity of the material is quantized and depends only on fundamental constants, rather than on the specific details of the material.

Another example of a topological state is the topological insulator, which is a material that is an insulator in its bulk but has conducting surface states. These surface states have nontrivial topology and are protected from scattering by impurities or defects, leading to robust and highly conductive electronic transport.
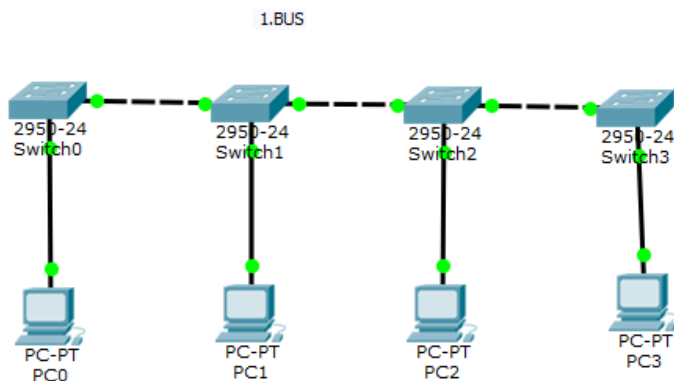
Topological states are of interest in condensed matter physics due to their unusual electronic properties and potential applications in fields such as quantum computing and spintronics.

Equipment:

- 1841 router
- 2960-24 switch
- PC-PT end devices
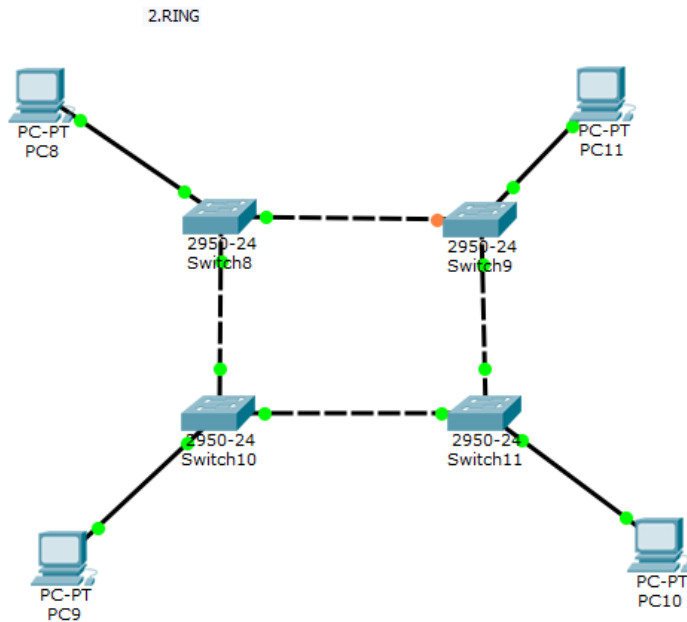- Hub_pt
- Wire

Topology Structure:

1.Bus Topology-

1.BUS

Step For Bus Topology:

In a bus topology , all nodes in the network are connected directly to a central cable that runs up and down the network - this cable is known as the backbone . Data is sent up and down the backbone until it reaches the correct node.

2.Ring Topology-

2.RING

<u>Step For Ring Topology:</u>

Ring topology is a type of network topology in which each device is connected to two other devices on either side via an RJ-45 cable or coaxial cable. This forms a circular ring of connected devices which gives it its name. Data is commonly transferred in one direction along the ring, known as a unidirectional ring.
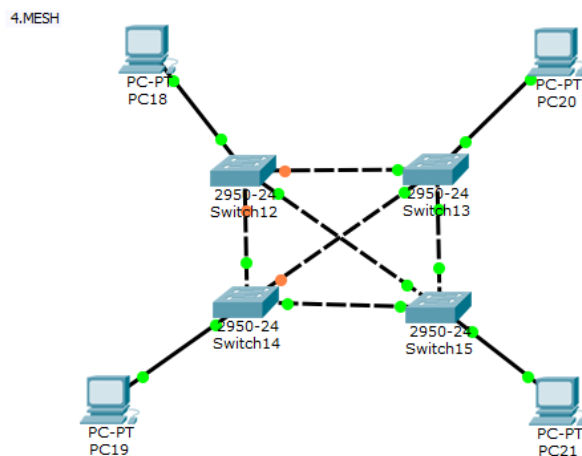
3. Star Topology-
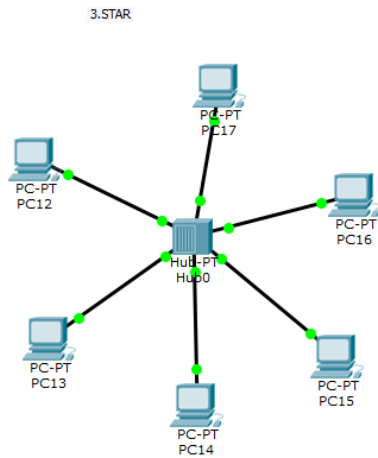
Step For Star Topology:

With a star topology setup, each node (such as a computer) within your company or team connects to one central network device (which could be a hub, a switch, or a computer) via a cable. The central network is the server, and the other devices are clients.
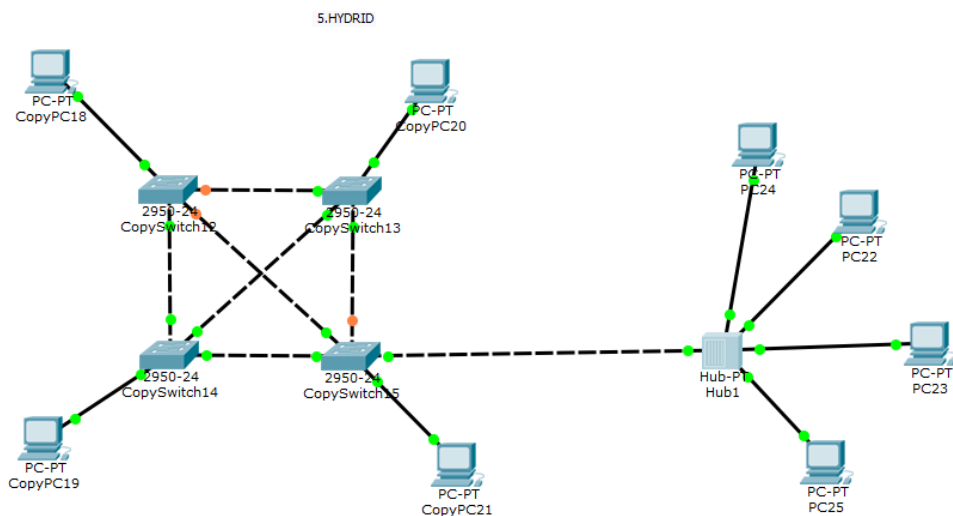
4.Mesh Topology-

Step For Mesh Topology:

Mesh topology is a type of network topology in which all devices in the network are interconnected. In a mesh topology, data can be transmitted by routing (sent the shortest distance) and flooding (sent to all devices). The two types of mesh topology are: Full mesh topology.

5. Hybrid Topology-

5.HYDRID

Step For Hybrid Topology:

It is the combination of two or more different topologies. For example, in a college we have so many departments, let us say one department uses ring topology and another department uses Star topology, connecting these two topologies which results in Hybrid Topology.