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Network topology

Network topology is the arrangement of the elements (links, nodes, etc.) of a communication network.[1][2] Network topology can be used to define or describe the arrangement of various types of telecommunication networks, including command and control radio networks,[3] industrial fieldbusses and computer networks.

Network topology is the topological[4] structure of a network and may be depicted physically or logically. It is an application of graph theory[3] wherein communicating devices are modeled as nodes and the connections between the devices are modeled as links or lines between the nodes. **Physical topology** is the placement of the various components of a network (e.g., device location and cable installation), while **logical topology** illustrates how data flows within a network. Distances between nodes, physical interconnections, transmission rates, or signal types may differ between two different networks, yet their logical topologies may be identical. A network's physical topology is a particular concern of the physical layer of the OSI model.

Examples of network topologies are found in local area networks (LAN), a common computer network installation. Any given node in the LAN has one or more physical links to other devices in the network; graphically mapping these links results in a geometric shape that can be used to describe the physical topology of the network. A wide variety of physical topologies have been used in LANs, including ring, bus, mesh and star. Conversely, mapping the data flow between the components determines the logical topology of the network. In comparison, Controller Area Networks, common in vehicles, are primarily distributed control system networks of one or more controllers interconnected with sensors and actuators over, invariably, a physical bus topology.

Topologies

Topologies

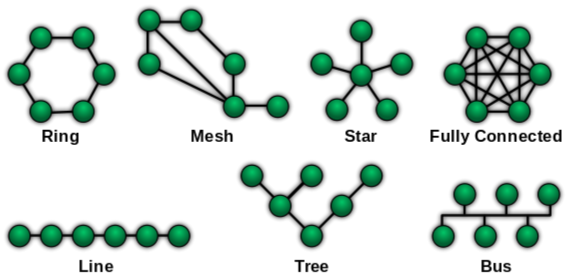

Diagram of different network topologies.

Two basic categories of network topologies exist, physical topologies and logical topologies.[5]

The transmission medium layout used to link devices is the physical topology of the network. For conductive or fiber optical mediums, this refers to the layout of cabling, the locations of nodes, and the links between the nodes and the cabling.[1] The physical topology of a network is determined by the capabilities of the network access devices and media, the level of control or fault tolerance desired, and the cost associated with cabling or telecommunication circuits.

In contrast, logical topology is the way that the signals act on the network media,[6] or the way that the data passes through the network from one device to the next without regard to the physical interconnection of the devices.[7] A network's logical topology is not necessarily the same as its physical topology. For example, the original twisted pair Ethernet using repeater hubs was a logical bus topology carried on a physical star topology. Token Ring is a logical ring topology, but is wired as a physical star from the media access unit. Physically, AFDX can be a cascaded star topology of multiple dual redundant Ethernet switches; however, the AFDX Virtual links are modeled as time-switched single-transmitter bus connections, thus following the safety model of a single-transmitter bus topology previously used in aircraft. Logical topologies are often closely associated with media access control methods and protocols. Some networks are able to dynamically change their logical topology through configuration changes to their routers and switches.

Links

Nodes

Classification

Centralization

Decentralization

See also

References

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