

Report on Tree Topology and WAN: How They Work Together

Introduction

In today's world, large organizations often need to connect computers across different cities, states, or even countries. To do this, they use two important network concepts: **Wide Area Networks (WAN)** and **Tree Topology**. This report will explain what each of these is, how they work, and why they are commonly used together.

What is a Wide Area Network (WAN)?

A **WAN (Wide Area Network)** is a type of computer network that covers a large geographic area. Unlike smaller networks that might only cover a single room or building (like a Local Area Network, or LAN), a WAN can connect computers across cities, states, or even internationally. The **Internet** is the largest example of a WAN because it connects devices and networks all over the world.

Organizations with offices or branches in different locations, such as in **New York** and **Connecticut**, often use WANs to keep all their computers connected and sharing information. WANs enable employees to communicate, access shared files, and use applications no matter where they are.

What is Tree Topology?

Tree Topology is a way of arranging or organizing a network. Imagine a tree with a trunk, branches, and leaves. In a tree topology network:

- The **main central connection** acts like the "trunk" of the tree.
- The connections that branch out from this main trunk lead to other smaller branches.
- The "leaves" at the ends of these branches represent the computers or devices at each location.

In a tree topology, there are multiple levels of connections, and each level can connect to the level below it. For example, a **router** (a device that directs data to where it needs to go) might connect to several **switches** (which direct data within smaller areas), and each switch connects to multiple **computers**.

Why Use Tree Topology in a WAN?

Tree topology works well with WANs because it's **organized**, **secure**, and **scalable** (meaning it's easy to add more devices or branches if needed). Let's break down how tree topology benefits a WAN:

1. Hierarchical Structure:

- The structure of tree topology allows devices to be connected in levels or layers. In a WAN, each branch office (like in New York or Connecticut) can have its own small network.
- The WAN connects these branch networks together, creating a larger, organized system. Each branch connects to a central router or server, which helps manage data flow across the entire network.

2. Fault Isolation (Limiting the Effects of Problems):

- If a computer or device on one branch has a problem (for example, it stops working or disconnects), it won't usually affect the entire network. Only the branch with the problem is affected.
- This is helpful for WANs, because if a computer in the New York office goes down, it won't affect the computers in Connecticut.

3. Centralized Management:

- In a tree topology, important devices like routers and switches are located at higher levels of the network. These devices can control and monitor the smaller branches connected to them.
- This makes it easier for IT staff to manage the network because they can monitor and control the entire network from a few central points.

4. Security:

- Since WANs often connect different locations over long distances, security is important. In a tree topology, devices like **firewalls** (which protect against unauthorized access) can be placed at key points in the network.
- For example, in your diagram, firewalls are located between switches and routers to protect each branch of the network. This setup helps keep data safe as it travels across the network.

Example Network Diagram Explanation

The diagram shows two main sections:

1. Tree Topology Diagram:

- Each **branch** is represented by a **router** at the top, connecting to a **firewall** (to secure the network) and a **switch** (to distribute data to computers).

- Below each switch are several computers. These computers can communicate within their own branch, and data can travel up the tree to reach other branches.
2. **WAN Diagram:**
- The **WAN** connects different branch locations, such as **New York** and **Connecticut**, through a network of routers.
 - Each location has its own tree structure. The New York branch has a router connected to a switch, which in turn connects to several computers. The Connecticut branch follows the same setup.
 - The WAN allows these two branches to stay connected, so data can flow between New York and Connecticut.
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Advantages of Using Tree Topology with WAN

1. **Easy to Expand:** If the organization wants to add a new branch in another city, it can simply connect a new branch to the central network. This flexibility makes it easy to grow the network.
 2. **Efficient Data Flow:** Tree topology ensures that data flows in an organized way. Information can be directed to the right branch without affecting other parts of the network.
 3. **Reliability:** If one part of the network has a problem, it doesn't bring down the entire system. For example, if a computer in one branch breaks, other branches can still operate normally.
 4. **Central Control:** Centralized management makes it easier to monitor and control the network. The main routers and switches at the top levels can manage data flow and ensure network security.
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Disadvantages of Using Tree Topology with WAN

1. **Dependency on Higher-Level Devices:** If a main router or switch fails, it can affect many branches below it. This is a single point of failure risk, meaning if one part breaks, a large part of the network can go down.
 2. **Complexity and Cost:** A tree topology can be more complex to set up and maintain, especially if there are many branches. This requires more hardware (like routers, switches, and firewalls) and can be expensive.
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Conclusion

Tree topology is a great choice for organizing a WAN. It allows large networks to be divided into manageable sections, making it easy for organizations to connect multiple branches. While it can be more complex and costly, the benefits of organization, security, and fault tolerance make it ideal for large, dispersed networks.

For an organization with offices in different locations, a WAN using tree topology provides a secure, organized, and efficient way to stay connected across long distances. This setup is common in businesses, schools, and other institutions that need to link multiple sites.

Diagram(Made in Figma):

