

#### **WAN Topology Options**

1. Point-to-Point : Typically uses a leased-line connection, like T1/E1, to connect two sites
2. Hub and spoke WAN Topology : Also known as point-to-multi point. Allows a single physical router interface to serve as a hub that connects to multiple sites over virtual circuits. All traffic between spoke sites must pass through the hub router.
3. Full mesh topology : In a full mesh topology, each network node is connected to every other network node. This type of inter connectivity results in highest level of redundancy.
4. Single homed : Spoke VPN sites connect to a single hub router.
5. Dual-homed network : Spoke VPN sites connect to two hub routers. This type of network is more expensive and more difficult to implement than single-homed networks.

#### Advantages of Wireless LAN Controllers:

1. Centralized management of Access Points and the WLAN network.
2. Application of system-level mobility policies
3. Ease of relocating/replacing/installing a new AP in a wireless LAN network.

Disadvantage: If a WLC (Wireless LAN Controller) fails, all the Aps connected to it will become in-operative. However, this may be overcome by providing fail-over WLC.

#### **WAN Terms**

1. Modems: Modems connect to public telephone circuits through dial-up.
2. CSU/DSU: Stands for Channel Service Unit / Data Service Unit. CSU/DSUs are used for connecting to Central Office of a Telephone switching company and provides serial WAN connections.
3. Multiplexers (mux): Multiplexers combine two or more signals before transmitting on a single channel. Multiplexing can be done by sharing "time" or "frequency".
4. CPE stands for Customer Premise Equipment.
5. Demarc : Demarcation point between carrier equipment and CPE.

#### **WAN Access Connectivity Options**

1. MPLS : Multi Protocol Layer Switching allows most packets to be forwarded at layer 2. Each packet gets labeled on entry into the service provider's network by the ingress router. All the subsequent routing switches perform packet forwarding based only on those labels - they never look as far as the IP header. Finally, the egress router removes the label(s) and forwards the original IP packet toward its final destination.
2. Metro Ethernet : Metro Ethernet can connect business local area networks (LANs) and individual end users to a wide area network (WAN) or to the Internet. Corporations, academic institutions and government agencies in large cities can use Metro Ethernet to connect branch campuses or offices to an intranet. A typical Metro Ethernet system has a star network or mesh network topology with individual routers or servers interconnected through cable or fiber optic media.
3. Broadband Pppoe : PPPoE stands for Point-to-Point-Protocol over Ethernet. PPPoE relies on two widely accepted standards: PPP and Ethernet. It is a specification for connecting the users on an Ethernet to the Internet through a common broadband medium, such as a single DSL line, wireless device or cable modem. All the users over the Ethernet share a common connection, so the Ethernet principles supporting multiple users in a LAN combine with the principles of PPP, which apply to serial connections. It gives lot of familiar PPP features like authentication, encryption , and compression.
4. Internet VPN (DMVPN, site-to-site VPN, client VPN) : VPN allows the creation of private networks across the internet. Site-to-site VPN solutions enable businesses to connect and transport data using encryption and other security protocols. To securely relay information across the Public Internet, the VPN uses a security method called IPSec to build an encrypted tunnel from the provider's network to the customer's site. This secure path looks and acts like a private connection with additional security, even though it still uses the Internet to deliver voice calls and other forms of data.
5. Client VPN: A VPN client is an end device, software or user that is seeking connection, network or data services from a VPN. It is part of the VPN infrastructure and is the end recipient of VPN services.