# Key WAN Concepts

1. **WAN Connectivity Options**:
   * **Wired Broadband**: Includes technologies like DSL, Cable, and Optical Fiber. These use physical cables (copper or fiber) to provide internet connections.
   * **Wireless Broadband**: Includes options like Municipal Wi-Fi, Cellular, Satellite Internet, and WiMAX. These use radio waves instead of physical cables.
2. **DSL Technology**:
   * **DSL**: A technology that uses existing telephone lines to provide internet access. It is a popular choice for home and small business users.
   * **ADSL**: A type of DSL where the download speed is higher than the upload speed.
   * **SDSL**: A type of DSL where the upload and download speeds are the same.
3. **Cable Technology**:
   * Uses coaxial cables to provide internet access. It's a shared medium, meaning that as more people use the service, the available bandwidth per user can decrease.
4. **Optical Fiber**:
   * **FTTx**: Refers to various fiber-optic connections, like Fiber to the Home (FTTH), Fiber to the Building (FTTB), and Fiber to the Node/Neighborhood (FTTN). Optical fiber provides the highest bandwidth.
5. **Wireless Internet-Based Broadband**:
   * Technologies like Municipal Wi-Fi, Cellular networks, and Satellite Internet that use radio waves for internet connectivity.
6. **VPN Technology**:
   * **VPN**: Provides a secure, encrypted connection over the internet between private networks or between a user and a private network.
   * **Site-to-Site VPN**: Connects entire networks to each other.
   * **Remote Access VPN**: Allows individual users to connect securely to a private network.
7. **ISP Connectivity Options**:
   * **Single-homed**: A single connection to one ISP, with no redundancy.
   * **Dual-homed**: Two connections to the same ISP for redundancy.
   * **Multihomed**: Connections to multiple ISPs for better redundancy and load balancing.
   * **Dual-multihomed**: Multiple connections to multiple ISPs.

**Simplified Answers to Questions**

1. **Network Technology for Global Connectivity**:
   * A **WAN** (Wide Area Network) technology like **MPLS** or a **Site-to-Site VPN** is required to connect branch offices to corporate headquarters.
2. **Technology Over Public WAN**:
   * **VPN** (Virtual Private Network) is recommended to securely connect a branch office to the corporate site over a public WAN infrastructure.
3. **WAN Data Transmission Medium**:
   * **Fiber-optic cables** are used by service providers to transmit data over WAN connections using technologies like SONET, SDH, and DWDM.
4. **Characteristic of a WAN**:
   * A WAN covers a large geographic area and connects multiple smaller networks (like LANs or MANs).
5. **Network for Nationwide Connectivity**:
   * A **WAN** would be used to connect locations across the country.
6. **Internet Connection for a Small Company**:
   * A small company could use a **DSL** or **Cable** connection to the internet.
7. **OSI Model Layers for WAN Technologies**:
   * WAN technologies provide services to the **Data Link layer (Layer 2)** and the **Physical layer (Layer 1)** of the OSI model.
8. **High-Speed, Dedicated Metropolitan Connection**:
   * **Metro Ethernet** or a dedicated **fiber-optic connection** would best fulfill the need for high-speed, dedicated bandwidth between two sites in a metropolitan area.
9. **WAN Infrastructure for Constant Connectivity on Buses**:
   * **Cellular networks** (3G/4G/5G) and **Satellite Internet** would meet the requirements for constant connectivity.
10. **WAN Topology for Headquarters and Branches**:
    * A **Hub-and-Spoke** topology is most suitable, where the headquarters connects to all branches, but branches do not connect directly to each other.
11. **Characteristic of a WAN**:
    * A WAN connects multiple locations over a large geographical area, often using leased or public lines.
12. **Circuit-Switched WAN Technologies**:
    * **ISDN** and **PSTN** are common types of circuit-switched WAN technologies.
13. **Cost-effective WAN Infrastructure for Salespeople**:
    * **Cellular networks** and **VPN** over a public internet connection would meet the requirements for a low-cost connection for dispersed salespeople.