Network Design Manual

Designing and Building the Best Small Office-Home Office (SOHO) Network for 2024

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1. Functional Requirements

Assessing Functional Requirements

Before designing your network, clearly define what you need it to accomplish. Perform a thorough assessment of expected functionalities, considering business applications, shared access requirements, multi-user databases, email, web servers, point-of-sale operations, and internet access. Document these needs and prioritize them to ensure critical business functions are addressed first.

Sizing the Network

Plan for current and future needs by estimating the number of users and their usage intensity. Build in extra capacity for growth, considering potential increases in data storage and user numbers.

Follow a Standard Approach

Use standard, industry-proven components to ensure compatibility and protect your investment. Consistency with organizational practices and standards is crucial, especially if future integration with larger networks is possible.

2. Network Topologies Considered

Ethernet

Ethernet is the dominant technology for small networks due to its affordability and flexibility. Options include 10Base-T (10 Mbps), 100Base-T (100 Mbps), and Gigabit Ethernet (1000 Mbps).

Fast Ethernet and Gigabit Ethernet

For high-performance needs, 100Base-T and 1000Base-T offer significant speed improvements. Use Gigabit Ethernet primarily for backbone connections rather than for connecting PCs and printers.

3. Network Cabling

Cabling Options

Modern Ethernet networks typically use twisted-pair cabling (Cat 5e, Cat 6, or Cat 6a). Fiber optics are reserved for high-bandwidth backbones or connections between buildings.

Wireless Technologies

Wireless LANs offer flexibility and ease of installation but have lower performance compared to wired networks. They are ideal for environments where cabling is challenging or mobility is required.

4. Servers and Services

File Services

File servers provide shared data storage, accessible by all users within the network. Implement access controls to manage data visibility and modifications.

Print Services

Networked printers are more efficient and cost-effective than individual printers for each user.

Web Servers and Application Servers

Consider setting up web servers for internal and external information sharing. Application servers can host industry-specific software and databases.

5. Network Operating System

Options

Popular network operating systems include Microsoft Windows Server, Linux distributions (such as Ubuntu Server or CentOS), and Unix-based systems.

Microsoft Windows Server

Widely used for its ease of administration and robust feature set, including Active Directory for user and resource management.

Linux/Unix

Offers high stability and performance, ideal for specialized applications and web servers.

6. Network Server Hardware

Selecting Server Hardware

Choose server-class hardware with sufficient processing power, memory, and reliable storage solutions (e.g., RAID configurations) to ensure performance and data integrity.

Backup Solutions

Implement regular backup routines using tape drives, external hard drives, or cloud-based solutions to protect against data loss.

7. Connectivity

Internet Access

Consider the required bandwidth and connection type (e.g., fiber, DSL, cable) based on the organization's needs. Use routers and firewalls to manage and secure internet connections.

Remote Access

Implement secure VPN solutions for remote access to the network, ensuring data security and compliance with organizational policies.

8. Client Computers

Network Configuration

Ensure client computers are equipped with network interface cards (NICs) and configured with the appropriate software for network access.

Software

Install necessary applications, including web browsers, email clients, and any specialized software required for business operations.