Computer Architecture - Hardware, Network and Software

Assignment 1: Draw your Home Network Topology and explain how you are accessing the RPS Lab environment.

Home Network Topology

Below is a diagram of a typical home network topology. I will describe how the various components connect and how I access the RPS Lab environment.

Diagram Description:

1. **Internet Connection:**

    - Provided by an ISP (Internet Service Provider).

    - Enters the home through a modem.

2. **Modem:**

    - Connects to the ISP and converts the incoming internet signal to a digital signal usable by home devices.

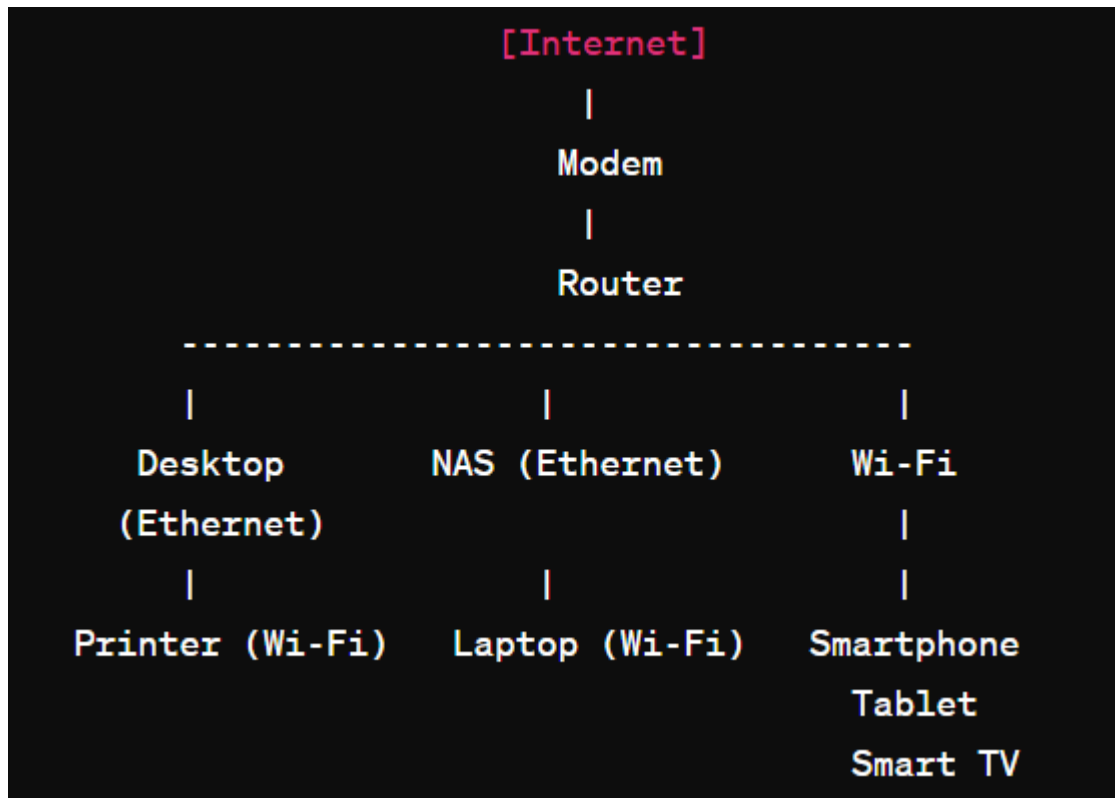   - Connects to the router via an Ethernet cable.

3. **Router:**

    - Distributes the internet connection to various devices in the home network.

    - Provides both wired (Ethernet) and wireless (Wi-Fi) connections.

4. **Devices:**

    - **Wired Devices:** Desktop PC, Network Attached Storage (NAS).

    - **Wireless Devices:** Laptop, Smartphone, Tablet, Smart TV.

Home Network Topology Diagram:

```
                    [Internet]
                        |
                      Modem
                        |
                      Router
    ---------------------------------------------
        |                   |                   |
     Desktop          NAS (Ethernet)         Wi-Fi
    (Ethernet)                                  |
        |                   |                   |
 Printer (Wi-Fi)    Laptop (Wi-Fi)        Smartphone
                                            Tablet
                                           Smart TV
```

Accessing the RPS Lab Environment

To access the RPS Lab environment from my home network, I follow these steps:

1. **Connect to the Home Network:**

    - Ensure my laptop is connected to the home Wi-Fi network.

2. **Secure Access:**

    - Use a Virtual Private Network (VPN) to securely connect to the university's network if required.

3. **Remote Desktop Connection:**

    - Use Remote Desktop Protocol (RDP) or Secure Shell (SSH) to remotely access the RPS Lab environment.

    - Enter the IP address or hostname of the RPS Lab server and my credentials.

4. **Two-Factor Authentication:**

- Complete any two-factor authentication steps required by the university for secure access.

5. **Access RPS Lab Resources:**

- Once connected, access the lab resources, software, and files needed for my work.

Assignment 2: Identify a real-world application for both parallel computing and networked systems. Explain how these technologies are used and why they are important in that context.

Parallel Computing: Weather Forecasting

Application:

- **Weather Forecasting:**

  - **Usage:** Meteorological agencies use parallel computing to run complex simulations and models that predict weather patterns.

  - **Importance:** Weather forecasting requires processing vast amounts of data from various sources (satellites, sensors, historical data) in real-time.

  - **Technology:** Supercomputers with multiple processors work in parallel to perform calculations faster and more accurately.

  - **Benefits:**

    - **Speed:** Accelerates the processing of large datasets.

    - **Accuracy:** Enhances the precision of weather predictions.

    - **Timeliness:** Provides timely weather updates, crucial for public safety and planning.

References:

- National Oceanic and Atmospheric Administration (NOAA) uses parallel computing for weather models: NOAA's supercomputers.

Networked Systems: Online Banking

Application:

- **Online Banking:**

- **Usage:** Banks use networked systems to offer online banking services, enabling customers to perform transactions, view statements, and manage accounts.

- **Importance:** Facilitates secure and efficient financial transactions over the internet.

- **Technology:** Utilizes secure internet connections, databases, and cloud services to handle user requests and transactions.

- **Benefits:**

  - **Convenience:** Provides customers with 24/7 access to banking services.

  - **Security:** Employs encryption and authentication protocols to protect sensitive data.

  - **Scalability:** Can handle large volumes of transactions and users simultaneously.

References:

- Citigroup's approach to networked systems in online banking: Citigroup's IT systems.