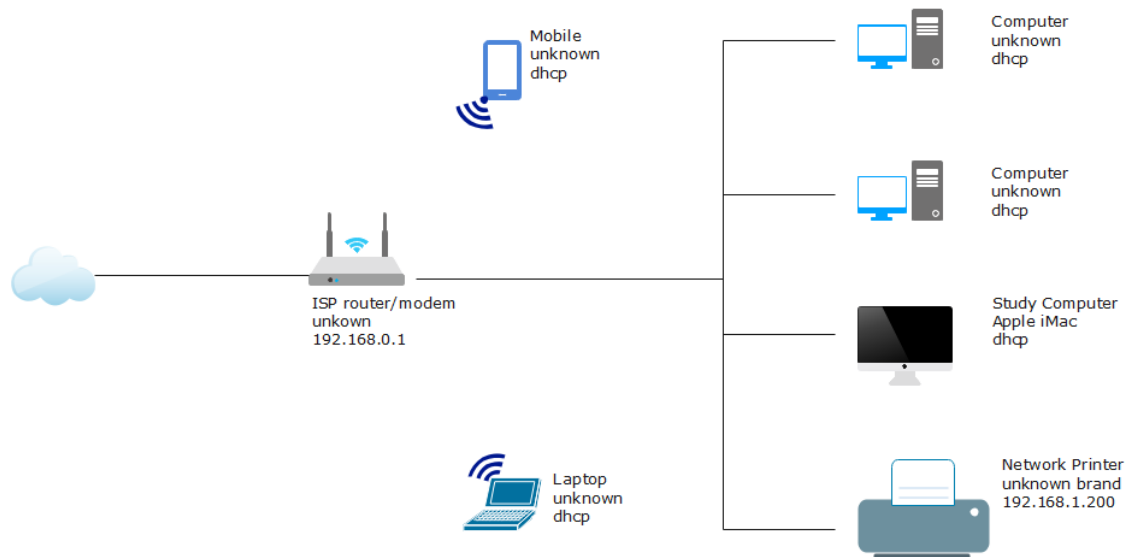# Assignment 1:

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

Sure, here is a description of a typical home network topology and how you might access an RPS (Remote PowerShell) Lab environment from it.

Home Network Topology

Visual Description:

Imagine a diagram with the following components connected to illustrate the home network topology:

1. **ISP (Internet Service Provider)**

   - **Symbol:** Cloud with "ISP" labeled inside.

   - **Description:** The ISP provides internet connectivity to your home network.

2. **Modem**

   - **Symbol:** Box labeled "Modem" connected to the ISP cloud with a line.

   - **Description:** The modem receives the internet signal from the ISP.

3. **Router**

   - **Symbol:** Box labeled "Router" connected to the Modem with a line.

   - **Description:** The router distributes the internet connection to various devices in your home.

4. **Devices:**

  - **Desktop Computer**

    - **Symbol:** Desktop icon connected to the Router.

    - **Description:** Your main computer used for accessing the RPS Lab.

  - **Laptop**

    - **Symbol:** Laptop icon connected to the Router (either wired or wirelessly).

    - **Description:** Portable device for internet access.

  - **Smartphone**

    - **Symbol:** Smartphone icon connected to the Router wirelessly.

    - **Description:** Mobile device connected to the home network.

  - **Smart TV**

    - **Symbol:** TV icon connected to the Router wirelessly or via Ethernet.

    - **Description:** TV connected to the internet for streaming services.

  - **Printer**

    - **Symbol:** Printer icon connected to the Router (either wired or wirelessly).

    - **Description:** Network printer available to all devices.

5. **Firewall**

   - **Symbol:** Shield icon between the Router and the ISP Cloud.

   - **Description:** Ensures network security by filtering incoming and outgoing traffic.

Accessing the RPS Lab Environment

Steps:

1. **VPN (Virtual Private Network) Connection:**

   - **Symbol:** Lock icon from the Desktop Computer to the RPS Lab Cloud.

   - **Description:** Use a VPN client on your desktop computer to securely connect to the RPS Lab environment. The VPN ensures that your data is encrypted and your connection is secure.

2. **RDP (Remote Desktop Protocol):**

   - **Symbol:** Arrow from the Desktop Computer to the RPS Lab Cloud.

   - **Description:** Once connected to the VPN, use RDP to access the remote machines in the RPS Lab. This allows you to control a remote computer as if you were sitting in front of it.

3. **PowerShell Remote Sessions:**

   - **Symbol:** PowerShell icon from the Desktop Computer to the RPS Lab Cloud.

   - **Description:** Open PowerShell on your desktop and use `Enter-PSSession` or `Invoke-Command` to establish a remote session with the lab environment. This allows you to run PowerShell commands on the remote servers.

Summary

- **ISP** provides internet access to the **Modem**.

- The **Modem** connects to the **Router**, distributing internet to all **Devices** (Desktop, Laptop, Smartphone, Smart TV, Printer).

- The **Firewall** between the Router and ISP provides network security.

- To access the **RPS Lab**, connect to a **VPN** from your **Desktop Computer**.

- Use **RDP** for remote desktop access and **PowerShell Remote Sessions** for command-line management of remote servers in the RPS Lab.

This network setup ensures secure and reliable access to the RPS Lab environment for remote system administration and development tasks.

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.

Sure! Here are real-world applications for both parallel computing and networked systems, along with explanations of their use and importance:

Real-World Application of Parallel Computing

Application: Climate Modeling and Weather Forecasting

How Parallel Computing is Used:

Climate modeling and weather forecasting require the simulation of complex physical processes across the atmosphere, oceans, and land. These simulations involve solving large-scale mathematical equations that represent fluid dynamics, thermodynamics, and chemical processes.

- **High-Performance Computing (HPC) Clusters:** Climate models are run on HPC clusters that consist of thousands of interconnected processors. Each processor performs calculations on a subset of the data, working in parallel to simulate different regions of the earth or different aspects of the climate system.

- **Grid Computing:** Climate data from multiple sources, such as satellites and weather stations, are processed and integrated using grid computing. This allows for distributed processing and storage, enabling more comprehensive and accurate models.

- **GPU Acceleration:** Graphics Processing Units (GPUs) are used to accelerate specific tasks within climate models, such as matrix operations and data visualization, by leveraging their parallel processing capabilities.

Importance:

- **Accuracy:** Parallel computing enables more detailed and accurate climate models by allowing for higher resolution simulations and the inclusion of more variables.

- **Speed:** It significantly reduces the time required to run complex simulations, enabling more timely weather forecasts and climate predictions.

- **Scalability:** Researchers can scale their simulations to larger and more detailed datasets, improving the understanding of climate change and its potential impacts.

Real-World Application of Networked Systems

Application: Online Multiplayer Gaming

How Networked Systems are Used:

Online multiplayer games require real-time interaction between players from around the world. This involves maintaining a continuous and synchronized connection between players' devices and game servers.

- **Client-Server Architecture:** Players connect to a central game server that manages the game state, player interactions, and game logic. The server receives inputs from players, processes the game state, and sends updates back to all clients.

- **Peer-to-Peer Networking:** In some games, players' devices communicate directly with each other to reduce latency and distribute the load. This is often used for real-time actions and data synchronization.

- **Content Delivery Networks (CDNs):** CDNs are used to distribute game updates, patches, and downloadable content (DLC) efficiently to players worldwide. This reduces the load on central servers and ensures fast and reliable content delivery.

- **Cloud Gaming Services:** These services, like NVIDIA GeForce Now and Google Stadia, use powerful remote servers to run games, streaming the gameplay to players' devices. This allows for high-quality gaming experiences without the need for high-end hardware.

Importance:

- **Real-Time Interaction:** Networked systems enable real-time gameplay, allowing players to interact seamlessly despite geographical distances.

- **Scalability:** They support a large number of concurrent players, essential for popular multiplayer games and events.

- **Reliability:** Distributed and redundant networked systems ensure game availability and reduce downtime, providing a stable gaming experience.

- **Performance:** By leveraging CDNs and cloud services, games can deliver high-quality graphics and performance without requiring significant local resources.

Summary

- **Parallel Computing in Climate Modeling:** Enables detailed, accurate, and fast simulations crucial for weather forecasting and understanding climate change.

- **Networked Systems in Online Gaming:** Facilitates real-time interaction, scalability, reliability, and high performance, enhancing the gaming experience for players worldwide.

Both technologies are essential in their respective contexts, driving advancements and delivering significant value to users and industries.