**Assignment on 25-07-2024**

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

+---------------------+

| Internet |

+---------------------+

|

|

+---------------------+

| Modem |

+---------------------+

|

|

+---------------------+

| Router |

+---------------------+

|

+-----------+------------+

| |

+--------------------+ +--------------------+

| Computer | | Other Devices |

+--------------------+ +--------------------+

**Home Device** (Laptop) -> **Wi-Fi/Ethernet** -> **Router** -> **Modem** -> **Internet** -> **VPN Gateway (Lab)** -> **RPS Lab Environment**

**Accessing the RPS Lab Environment**

1. **Internet:**
   * The home network connects to the wider Internet through an Internet Service Provider (ISP).
2. **Modem:**
   * The modem converts the digital signals from the ISP into signals that your home network can use. It's the bridge between your local network and the internet.
3. **Router:**
   * The router distributes the internet connection to various devices in the home, either via wired (Ethernet) or wireless (Wi-Fi) connections. It also manages local network traffic and provides security features like a firewall.
4. **Computer:**
   * The computer is a client device on the home network. It accesses various online services, including external environments like the RPS Lab.

**Security Considerations**

* **VPN Encryption**: Ensures secure transmission of data between your home device and the RPS Lab environment, protecting against potential eavesdropping or interception.
* **Firewall Rules**: Ensure both the home router and the lab’s network firewalls are configured to allow the necessary connections while blocking unauthorized access.

1. **Accessing the RPS Lab:**
   * To access the RPS Lab environment, the user typically uses a web browser or specific software application installed on their computer. This connection can be secured using VPN (Virtual Private Network) or SSH (Secure Shell) for secure access.
   * **Steps:**
     + **Open a web browser** or a specific application on the computer.
     + **Navigate to the RPS Lab login page** using a URL provided by the RPS Lab administrators.
     + **Authenticate** using credentials (username and password) to gain access to the RPS Lab resources.
     + Once authenticated, users can interact with the RPS Lab environment, which may include accessing virtual machines, development tools, and other resources hosted by RPS Lab.
2. **Google (Optional):**
   * If additional information is needed or if accessing documentation/support, users can use Google to search for relevant information. This step is not necessary for the connection but can be a useful resource.

**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**

**How It’s Used:**

* **Simulation Models**: Weather forecasting relies on complex simulation models to predict atmospheric conditions. These models involve solving a vast number of differential equations to simulate weather patterns, ocean currents, and atmospheric dynamics.
* **Parallel Processing**: These simulations are extremely computationally intensive and require substantial processing power. Parallel computing is employed to divide the simulation tasks among multiple processors or computing nodes. For instance, a weather model might be split into smaller grid cells, each processed simultaneously by different processors to simulate various parts of the globe.

**Why It’s Important:**

* **Speed**: Parallel computing dramatically reduces the time required to produce forecasts. High-resolution models that run on single processors might take weeks to compute, but with parallel processing, they can be completed in hours or even minutes.
* **Accuracy**: Faster computations allow for more frequent updates to weather models, improving the accuracy of short-term and long-term forecasts. This is critical for timely warnings and preparation for severe weather events.

**Networked Systems: Online Multiplayer Games**

**Application: Online Multiplayer Games**

**How It’s Used:**

* **Game Servers**: Online multiplayer games connect players from around the world through game servers. These servers manage game state, player interactions, and in-game events in real-time.
* **Networked Architecture**: The game server architecture often involves multiple servers handling different aspects of the game, such as player matchmaking, game logic, and data storage. Players’ devices (clients) connect to these servers over the internet to participate in the game.

**Why It’s Important:**

* **Real-Time Interaction**: Networked systems enable real-time communication and interaction between players, which is essential for a seamless and immersive gaming experience.
* **Scalability**: Networked systems can scale to accommodate large numbers of players simultaneously. Servers can be distributed geographically to reduce latency and improve performance, providing a smoother experience for players worldwide.
* **Maintenance and Updates**: Networked systems allow for regular updates, bug fixes, and new content to be pushed to players without requiring them to manually install patches, keeping the game fresh and engaging.

**Summary**

* **Parallel Computing** is crucial for applications requiring intense computation and large-scale simulations, such as weather forecasting. It enhances speed and accuracy by dividing complex tasks across multiple processors.
* **Networked Systems** are essential for applications that involve real-time communication and interaction among distributed users, such as online multiplayer games. They provide the infrastructure needed for global connectivity, scalability, and real-time data synchronization.