

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

How it's Used

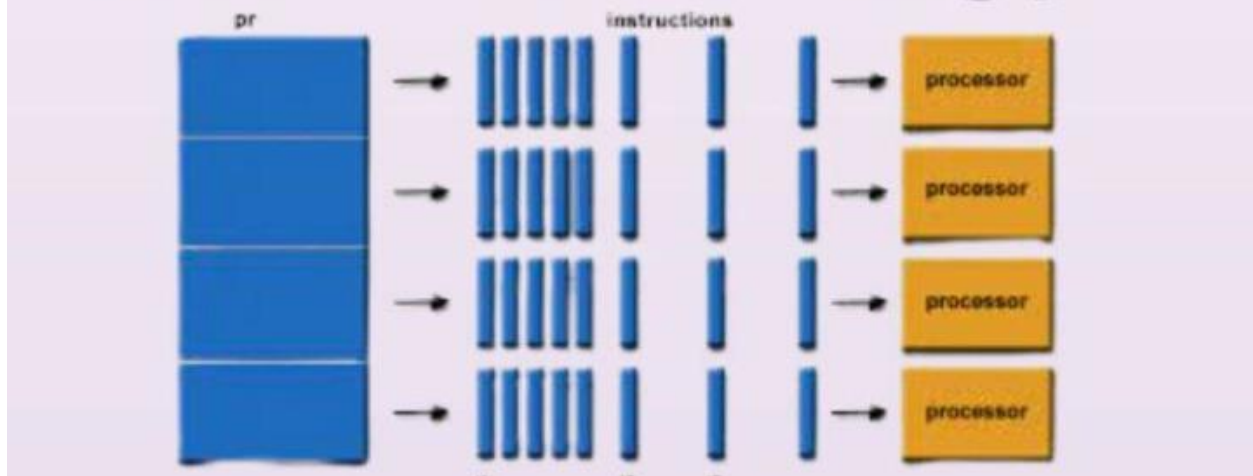
Weather forecasting involves simulating the Earth's atmosphere to predict weather conditions. This process relies heavily on numerical weather prediction (NWP) models, which use mathematical equations to represent atmospheric processes. These models require immense computational power to process large datasets and perform complex calculations, making parallel computing an essential tool.

In parallel computing, the task of weather prediction is divided into smaller sub-tasks that can be processed simultaneously across multiple processors. High-Performance Computing (HPC) systems, which consist of thousands of processors working in parallel, are typically used for this purpose. Each processor works on a different part of the model, and the results are combined to produce an accurate weather forecast.

Importance

1. **Speed and Efficiency:** Parallel computing significantly reduces the time required to run NWP models, allowing meteorologists to generate forecasts more quickly. This is crucial for timely weather predictions, especially for severe weather events.
2. **Accuracy:** The ability to process larger datasets and more complex models improves the accuracy of weather forecasts. Higher-resolution models, which require more computational power, can capture smaller-scale weather phenomena.
3. **Real-Time Updates:** Parallel computing enables near real-time updates to weather forecasts, providing up-to-date information that is vital for decision-making in industries like aviation, agriculture, and disaster management.

Parallel Computing: Real-life Analogy



Networked Systems: Online Multiplayer Gaming

How it's Used

Online multiplayer gaming involves players from around the world connecting to a central game server or a network of servers to play a game together. Networked systems are crucial for managing the communication and data exchange between these players in real time.

In this context, networked systems ensure that game state information (such as player positions, actions, and interactions) is consistently and accurately synchronized across all players. Techniques such as client-server architecture, peer-to-peer networking, and cloud gaming infrastructure are used to achieve this.

Importance

1. **Real-Time Interaction:** Networked systems enable players to interact with each other in real time, creating a seamless and immersive gaming experience. Low latency and high-speed data transfer are critical to maintaining the fluidity of gameplay.

2. **Scalability:** Networked systems allow games to support a large number of players simultaneously. Cloud gaming services can dynamically allocate resources based on the number of active players, ensuring consistent performance.
3. **Reliability and Security:** Robust networked systems provide the necessary security measures to protect player data and prevent cheating or hacking. They also ensure high availability and uptime, allowing players to access the game without interruption.