Tools and Architecture Activities

Activity 1: Evaluate preferred tools for model production and their advantages and disadvantages through online polls.

Instructions:

1. Create a list of popular model production tools (e.g., Docker, Kubernetes, Apache Airflow, TensorFlow Serving, etc.).
2. Choose an online poll (eg. Google Forms, SurveyMonkey, Typeform, Poll Everywhere, Microsoft Forms) for each tool by creating an account into your chosen platform and create a new poll and add questions in that.
3. Ask your peers to evaluate the advantages and disadvantages of each tool. Include specific evaluation criteria such as ease of use, scalability, flexibility, and resource requirements.
4. Look at the aggregated poll results showing how your peers have rated each tool.
5. Based on the poll results, write a short reflection on the preferred tool and justify the choice with the advantages and disadvantages discussed in the poll.

Activity 2: Analyse parallel computing's impact on performance of the system based on the given scenario.

Scenario: Large-Scale Weather Prediction System

The National Weather Service implemented a large-scale weather prediction system using MIMD (Multiple Instruction Multiple Data) architecture to forecast severe weather patterns. The system utilised a distributed computing approach, with thousands of processing units spread across multiple locations. Each processing unit handled different parts of the weather data, including temperature, pressure, and wind speed, simultaneously. This parallel approach allowed the system to

process vast amounts of real-time weather data faster than traditional sequential systems.

However, several challenges arose during implementation:

1. **Load Balancing:** Some processing units became overloaded with complex computations, leading to bottlenecks, while others were underutilised.
2. **Synchronisation Overhead:** Ensuring that all processing units stayed synchronised and shared updated data without delays caused performance issues.
3. **Communication Overhead:** Constant data exchanges between processing units across different locations led to increased communication costs, affecting the overall system performance.

Despite these challenges, the system improved prediction accuracy and speed significantly. This allowed for earlier warnings for severe weather events, potentially saving lives and reducing damage.

Instructions:

1. Read the scenanio above on the weather prediction system using MIMD architecture.
2. Analyse how the parallel computing architecture impacted the performance of the system.
3. Write a short analysis explaining the following:
    - How MIMD architecture helped enhance the system's performance.
    - The impact of the challenges faced (load balancing, synchronisation, and communication).
    - Possible solutions to overcome these challenges.

Share your work from both the activities with your peers or mentor for further insights.