# Multi-Agent Systems Assignment

## Preparation

1. Watch the Webinar

Watch the webinar about how Clearwater Analytics uses multi-agent systems (MAS). Take good notes about how the system works, the challenges it faces, and the problems it solves.

2. Answer the Following Questions:

Use your notes and any extra research to answer the questions in detail.

## 1. Describe the Multi-Agent System Architecture Used by Clearwater Analytics

Main Types of Agents:

- Data Aggregators: These agents collect raw financial data from different sources and clean it up so it’s ready for analysis. This step reduces errors and ensures the data is reliable.

- Analysis Agents: These agents handle calculations like assessing risks, predicting portfolio performance, and optimizing investments.

- Communication Agents: These agents make sure the data flows smoothly between all the parts of the system and external tools, keeping everything connected.

How the Agents Work Together:

The agents communicate through a decentralized system, meaning no single part controls everything. They use tools like APIs and publish-subscribe models to share data in real time. This helps the agents adapt quickly to changes and work together efficiently to solve problems.

Problems Solved by MAS:

- Handling Big Data: The system processes huge amounts of financial data faster than people could.

- Improved Decisions: By automating calculations like risk analysis, the system gives better insights to its users.

- Scalability: As the company grows, the system can handle more data without needing major changes.

## 2. Analyze Potential Limitations or Challenges of the Multi-Agent System

Challenges Identified:

- Complexity: It’s hard to manage so many independent agents, and fixing issues can take a lot of time.

- Scalability Problems: Adding more agents might make the system slower if it’s not well-optimized.

- Security Risks: Decentralized systems are sometimes easier to hack or feed with fake data.

Suggestions for Improvement:

- Fault Tolerance: Add tools to spot and fix problems with individual agents so the whole system doesn’t fail.

- Better Coordination: Use improved methods, like consensus models, to keep agents working together smoothly.

- Real-Time Monitoring: Install tools to track the system as it runs, so problems are found and fixed faster.

Ethical Considerations:

- Data Privacy: Be open about how user data is used and make sure it’s not shared without permission.

- Avoiding Bias: Check the system’s algorithms to make sure they are fair and don’t favor some outcomes unfairly.

- Security: Protect sensitive financial data with strong encryption to keep it safe from cyberattacks.

## 3. Research and Compare Another MAS Implementation

IBM’s Multi-Agent System:

IBM uses MAS in industries like healthcare, supply chain management, and cybersecurity. For example, in healthcare, IBM’s agents predict diseases by analyzing patient data.

Comparison with Clearwater Analytics:

- Similarities: Both systems use multiple agents to automate tasks and handle large amounts of data. They focus on efficiency and scalability to keep up with their industries’ demands.

- Differences: Clearwater focuses only on financial analytics, while IBM uses MAS in healthcare, defense, and more. IBM also integrates advanced AI for predictions like disease forecasting, while Clearwater focuses more on financial optimization. In terms of ethics, IBM faces stricter rules about patient data privacy, while Clearwater’s main concern is protecting financial data.

## Submission Tips:

- Write your answers clearly, using 12-point font and double spacing.

- Show detailed thinking and back up your answers with examples from the webinar and research.