Report on Storage Simulator Extension

1. What questions lead you to this simulator extension?
   - How does a client-server model compare to a peer-to-peer (P2P) model in terms of data backup and recovery?
   - What is the impact of different node configurations (like storage capacity, uptime, and data size) on the efficiency and reliability of the network?
   - How do different network topologies affect data redundancy and the ability of the system to recover from node failures?

2. Why do you think they are relevant?
   - Understanding the strengths and weaknesses of different network architectures is crucial for designing robust and efficient data storage systems.
   - Insights into how different configurations impact performance can guide the development of more resilient and scalable backup solutions.
   - With the growing amount of data and the importance of data security, optimizing network architecture for backup and recovery is highly pertinent.

3. How did you do that?
   - Developed a discrete event simulation in Python using `storage.py` to model both client-server and P2P network architectures.
   - Utilized configuration files (`client_server.cfg` and `p2p.cfg`) to simulate various network conditions and node behaviors.
   - Implemented custom events and state changes within the simulation to reflect real-world scenarios, such as node failures and data transfers.

4. Level of Detail and Technical Insights
   - Focused on the algorithmic aspect of event handling within nodes, ensuring realistic simulation of network behaviors.
   - Paid attention to the accuracy of time-based events, such as node uptime and downtime, to mimic real-world unpredictability.
   - Explored the impact of network parameters by varying values in configuration files and observing changes in simulation outcomes.

5. Unexpected, Surprising, and Interesting Findings
   - Observed that in certain configurations, P2P networks could outperform client-server models in data recovery, contrary to initial expectations.
   - The resilience of the network to node failures was heavily influenced by the distribution of storage and data sizes across nodes.
   - Notably, the system's overall efficiency was highly sensitive to the configuration of upload and download speeds.

6. Answers to the Original Questions

- The client-server model generally offers more stability, but P2P networks can achieve higher redundancy and resilience in some scenarios.
- The efficiency and reliability of the network are significantly impacted by node configuration, with storage size and uptime being key factors.
- Network topology plays a crucial role in determining the system's ability to handle data loss and node failures effectively.

7. Interpretation of the Results
- The results indicate that there is no one-size-fits-all solution for network architecture in data storage systems.
- Tailoring the network configuration to specific use cases is essential for optimal performance and reliability.
- These insights highlight the importance of flexibility in network design, especially in environments with varying data sizes and availability requirements.

Conclusion
This simulation project sheds light on the complex dynamics of different network architectures in data storage and recovery contexts. The findings underscore the necessity of thoughtful network design and configuration to meet specific data backup and recovery needs efficiently.