**Fall 2023 ISEC 885 : Project Overview Report: Research on Asynchronous Consensus Protocols**

**Introduction:**

The Fall 2023 ISEC 885 provides exploratory research within the realm of Asynchronous Consensus, seeking to address critical gaps in existing protocols. At its core, this endeavor aims to contribute to the field by advancing the development of replicatable asynchronous infrastructures capable of measuring key metrics such as throughput and latency. In doing so, it aims to overcome the limitations posed by synchronous consensus protocols, particularly in environments characterized by faults and unpredictable delivery times. The research will focus on the Aleph protocol who claims to be one of the first asynchronous consensus protocols without a trusted dealer.

**Objective:**

During the Winter 2024 ISEC 885 course, the objective is to formulate a research idea paper focused on enhancing Asynchronous Consensus. Specifically, the goal is to devise a replicatable framework for deploying the Aleph protocol, tailored to meet the demands of permission-less blockchains while eliminating the reliance on a trusted dealer. By establishing a standardized test environment for Aleph, this research seeks to catalyze further advancements and studies within the Asynchronous Consensus.

Current Level of Completion:

At this stage, the project is in its early exploratory phase. Literature review and problem identification have been initiated, and the specific goal of creating a standardized test environment has been established, milestones, and deliverable are yet to be fully defined. A basic implementation of the Aleph protocol still needs to be deployed.

Milestones and Deliverables: The project will progress through the following milestones and deliverables:

* Problem identification and definition
* Concrete problem direction, need, and goal
* Literature review completion
* Experimental setup exploration and validation
* Quantitative assessment and performance analysis

Current Accomplishments:

* Initiated literature review and identified key problems within Asynchronous Consensus.

Scheduled Completions:

* Literature review completion by [Q4 2023]
* Finalization of concrete problem direction, need, and goal by [Q1 2024]
* Proposal of Idea Concept Paper [Q2 2024]
* Formal Idea Concept Paper [Q3 2024]
* Experimental setup exploration and validation by [Q4 2024]
* Quantitative assessment and performance analysis by [Q1 2025]
* Dissertation [Q4 2025]

Missed Targets: There are currently no missed targets as the project is still in its early stages.

Issues and Changes

Open Issues:

None at this time.

Open Change Requests:

Project was originally to redeploy the HoneyBadgerBFT but new findings show a need to redeploy Aleph given the need for more research on a asynchronous consensus without a trusted dealer..

Next Phase Schedule (Start and Completion Targets):

Finalization of concrete problem direction, need, and goal by [Q1 2024]

* Start Date: [January 2024]
* Completion Target: [April 2024]

Summary: The goal of the exploratory research, conducted as part of the Fall 2023 ISEC 885 course, is to establish a problem direction for a doctoral research idea concept paper, which will lead to a research idea paper. The goal is centered around the improvement of the field of asynchronous byzantine fault tolerance through the Aleph protocol. The final outcome will be a concrete problem, need, and goal. The technical goals of the research is to implement the Aleph protocol to create a baseline. This baseline will serve as a reference point for comparing both the original work of Aleph and any future research endeavors. After creating a base line the next technical goal will be replicating and contributing to Aleph such that previous results can be compared to and new research proposed.