

Distributed Consensus

Simulator for Sleepy Consensus Protocol

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- **Where to find our project?**

<https://github.com/initc3/sleepysim>

SleepySim

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1 Introduction

Consensus protocols are at the core of distributed computing and also provide a foundational building protocol for multi-party cryptographic protocols. In the paper about *sleepy consensus* protocol [1], Pass and Shi propose a consensus protocol for realizing a linearly ordered log abstraction – often referred to as state machine replication or linearizability in the distributed systems literature. They name it as sleepy consensus protocol, which respects two important resiliency properties, i.e., consistency and liveness. And in sleepy consensus model, players can be either online (alert) or offline (asleep), and their online status may change at any point during the protocol.

In this paper, we build a simulator for monitoring the real-world performance of sleepy consensus protocol by constructing a framework which implements sleepy consensus protocol, as well as imitating behaviors of honest players and corrupted/adversarial players in the meanwhile. After analyzing the simulating results, **we know ... add text here**

This document is organized as follows. In Section 2, we introduce the framework of simulator. In Section 3, we present how honest players work while simulating. And in Section 4, we imitate the adversarial players' behavior and attack the sleepy consensus protocol by several algorithms. We give the analysis of simulating results in Section 5. Finally, we draw conclusions in Section 6.

2 The Framework of Simulator

In this section, we will illustrate the construction of the framework of our simulator, which includes **add text here**

2.1 Controller

The LLNCS class is an extension of the standard L^AT_EX “article” document class. Therefore you may use all “article” commands for the body of your contribution to prepare your manuscript. LLNCS class is invoked by replacing “article” by “llnCS” in the first line of your document:

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3 The Imitation of Honest Players

4 The Imitation of Adversarial Players

The previous section introduces the implementation of the honest players' behavior under the sleepy consensus protocol in simulator. This section, in contrast, will present the imitation of the adversarial players' behavior, which

aims to hinder the normal functioning of sleepy consensus protocol under current framework structure. And we design four different attacking algorithms try to break the consensus between different nodes, i.e., players in the distributed system. What should be noticed is that the adversaries cannot betray the rules established by the framework, while they can only control the network message transportation, i.e., intercepting and delaying the message from honest players. Also, an adversary can manipulate several corrupted nodes in the system, by which adversary impose damage to the system under sleepy consensus protocol.

To simulate the attacks, we assume there is an adversary lurking within the framework, who owns competence to intercept all messages coming from honest nodes and decide which to delay in the transportation. Also, the adversary is able to access useful information from these message to fork blocks right behind the private chain he captures. Based on above setting, we design four attacking methods for adversary to smash the consensus holded by system, which are illustrated in following subsections.

4.1 Naïve Adversary Attack

4.2 Selfish Adversary Attack

4.3 Stubborn Adversary Attack

4.4 Selfish Eclipse Attack

5 The Analysis of Simulating Results

Here is the analysis of Simulating Results.

6 Conclusion

In conclusion....

References

1. Pass, Rafael, and Elaine Shi. *The sleepy model of consensus*. Cryptology ePrint Archive, Report 2016/918, 2016. <http://eprint.iacr.org/2016/918>, 2016.