Implementation of a robust and scalable consensus protocol for blockchain

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Proposal cosigning

- Time or timestamp services
- Certificate Authorities (CAs)
- Directory authorities
- Software update services
- Digital notaries
- Randomness services

Summary

- Introduction (done)
- CoSi protocol
- Work done (challenges and found solutions)
- Simulation results
- Conclusion (results, lessons learned, etc.)

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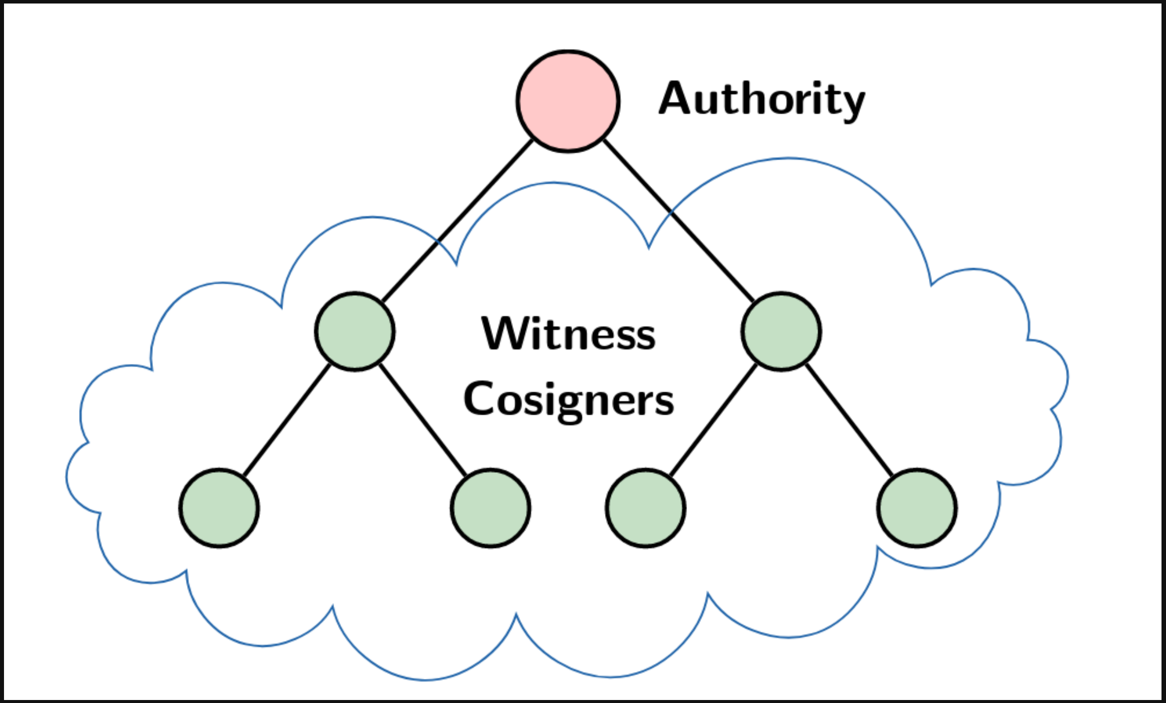
CoSi: Decentralized Witness Cosigning



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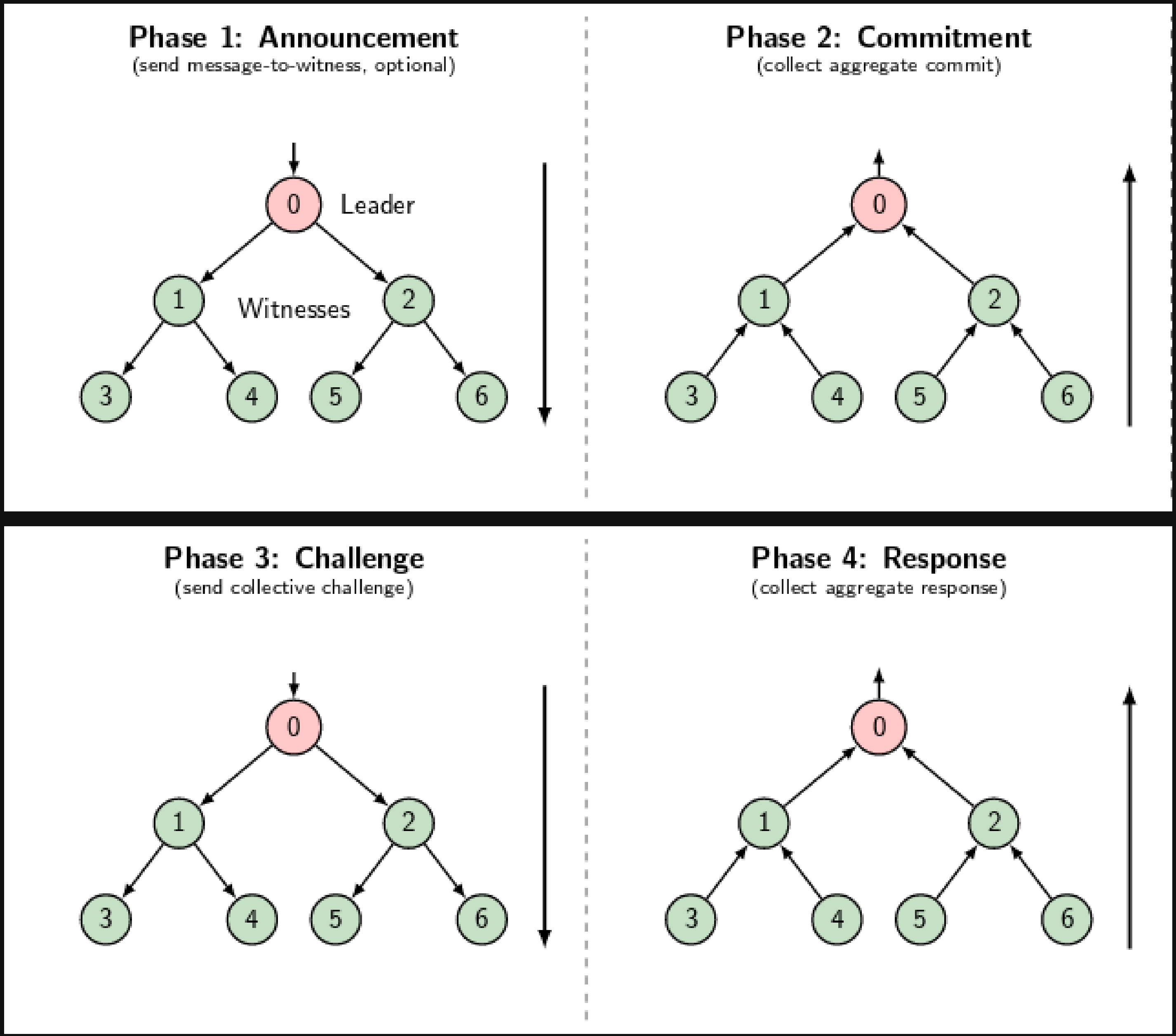
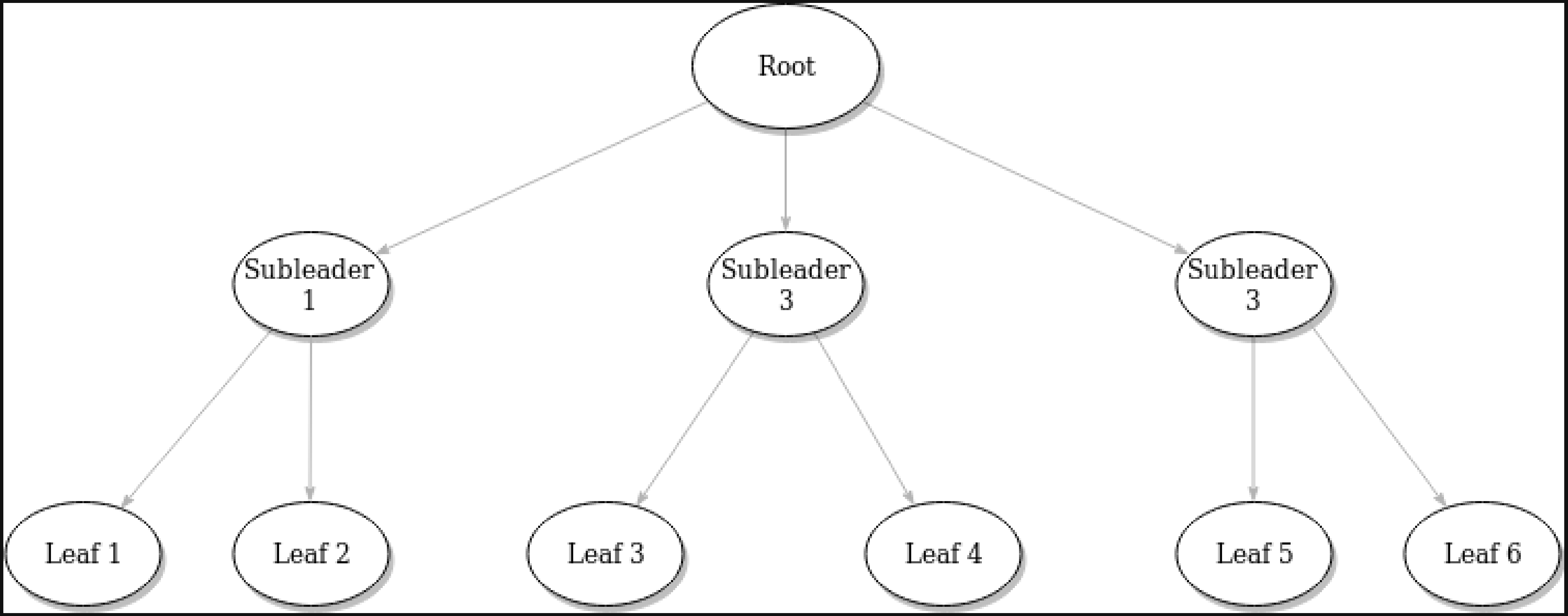


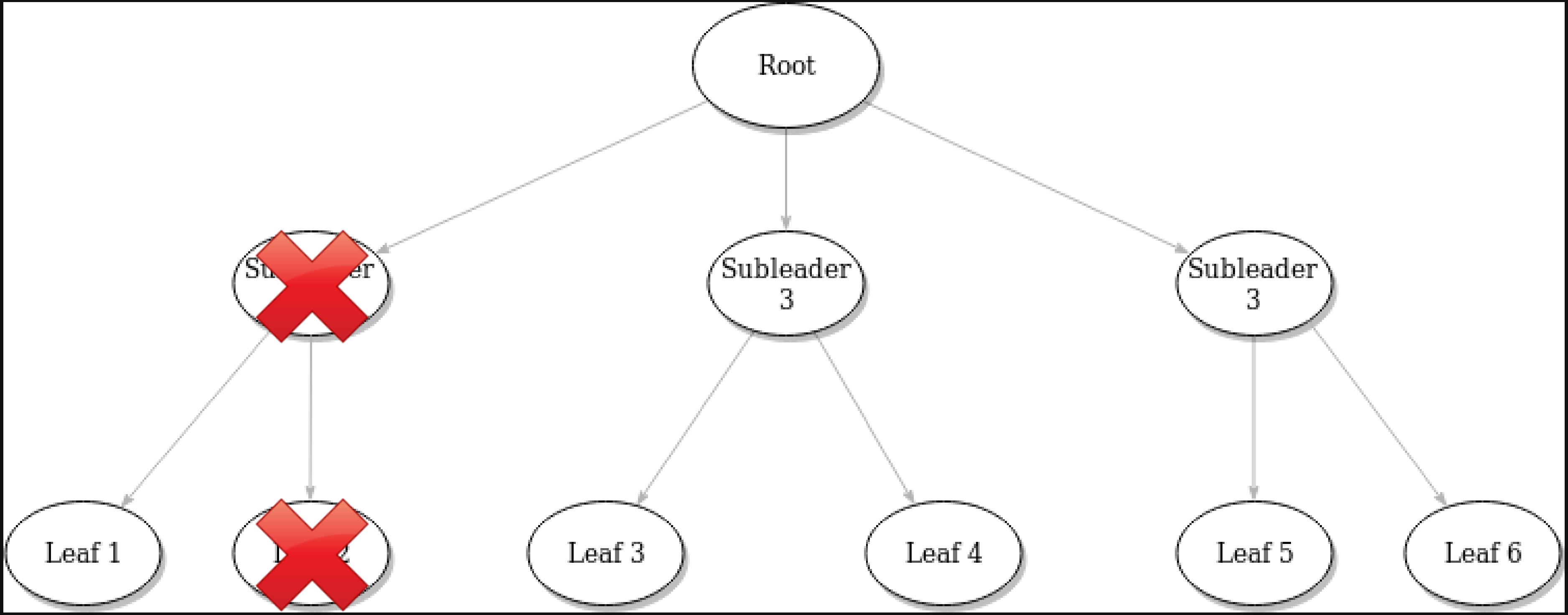
Objectives

- Have a solid implementation of the CoSi protocol
- Compatible with ONet and Kyber libraries
- Handle failing nodes
- Clean, tested and documented code

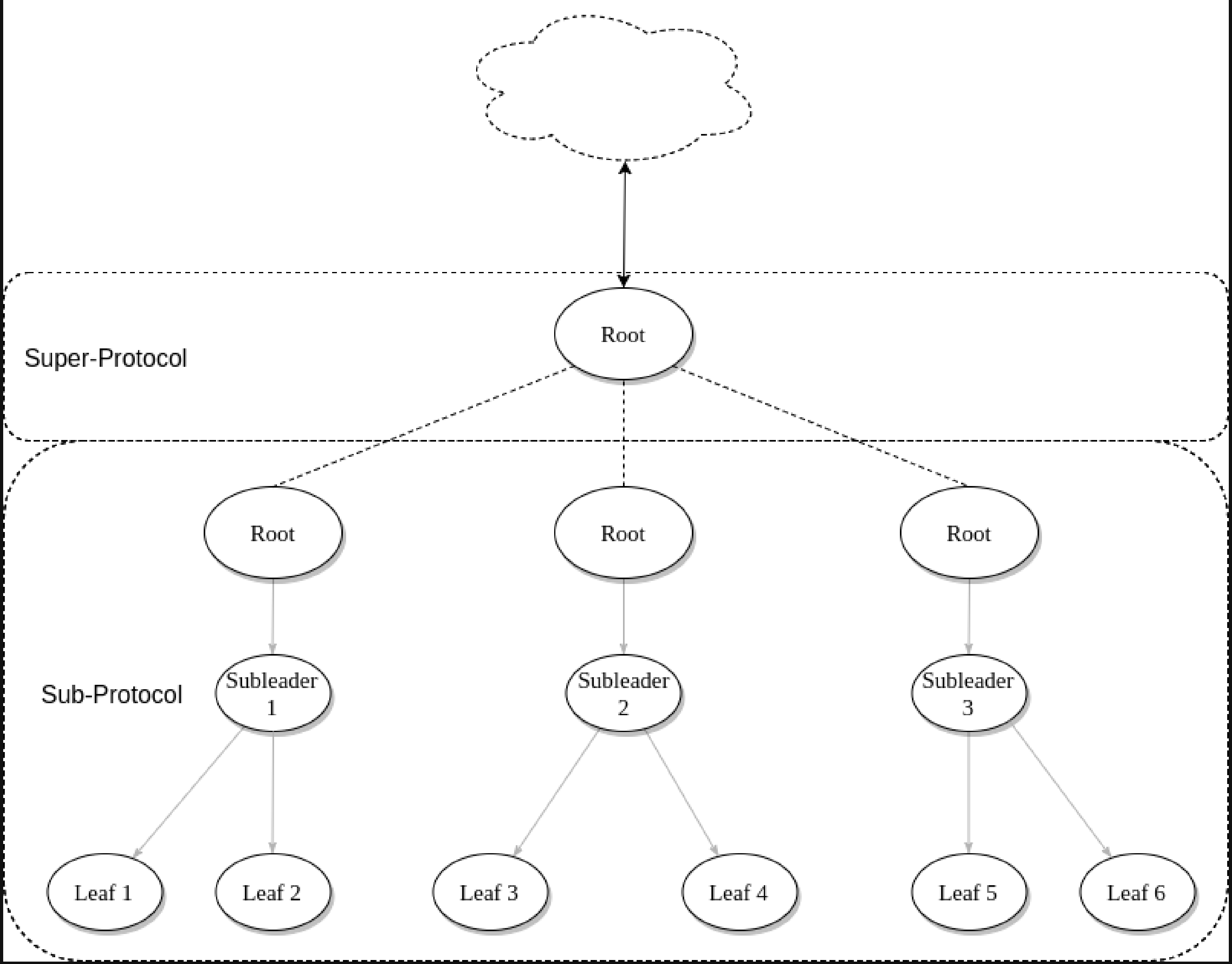
Tree generation



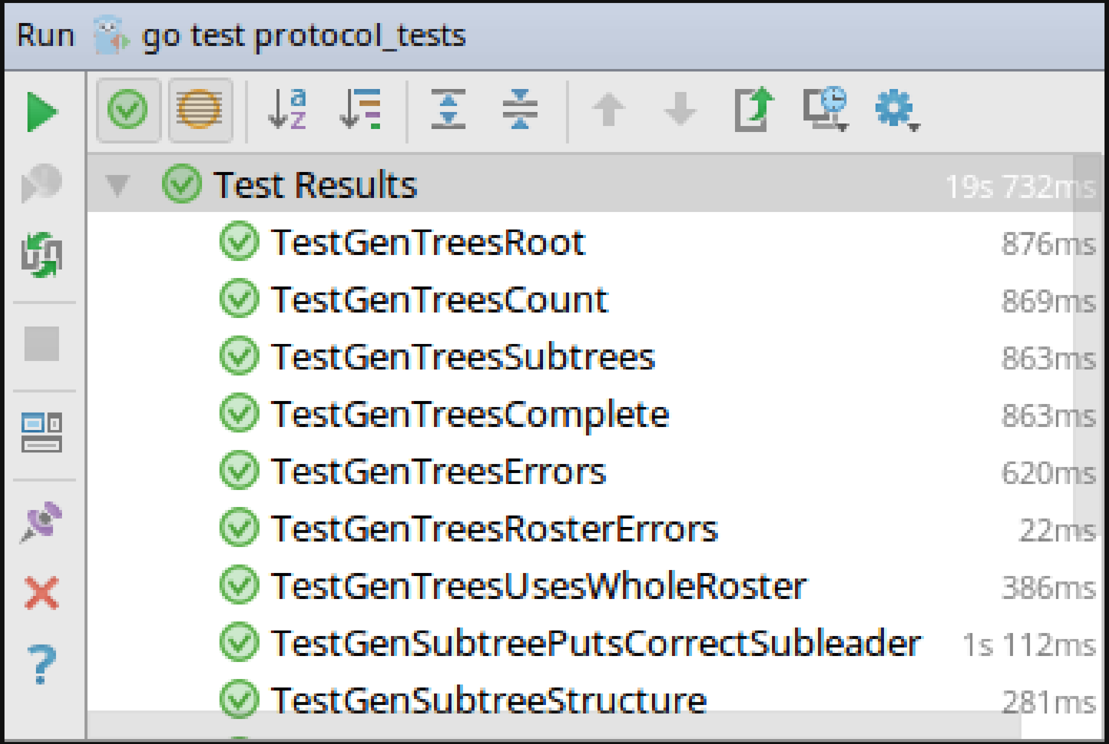
Failing nodes



Multiple sub-protocols



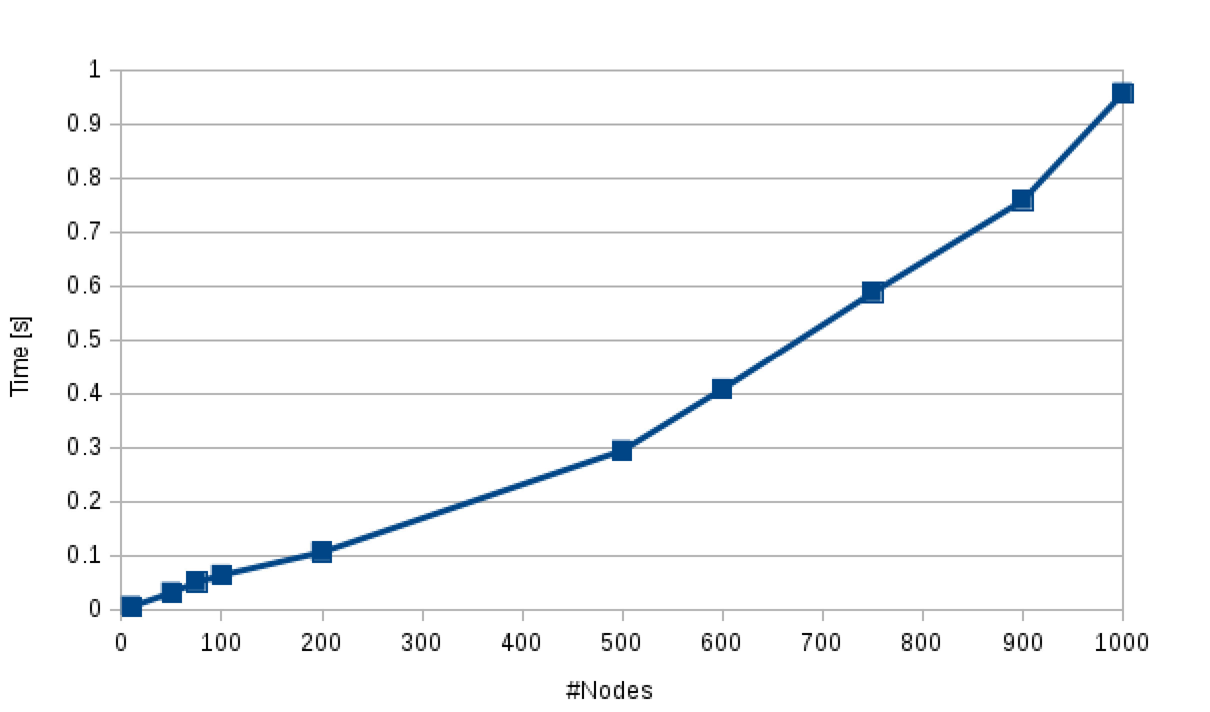
Unit tests and documentation



Run go test protocol_tests

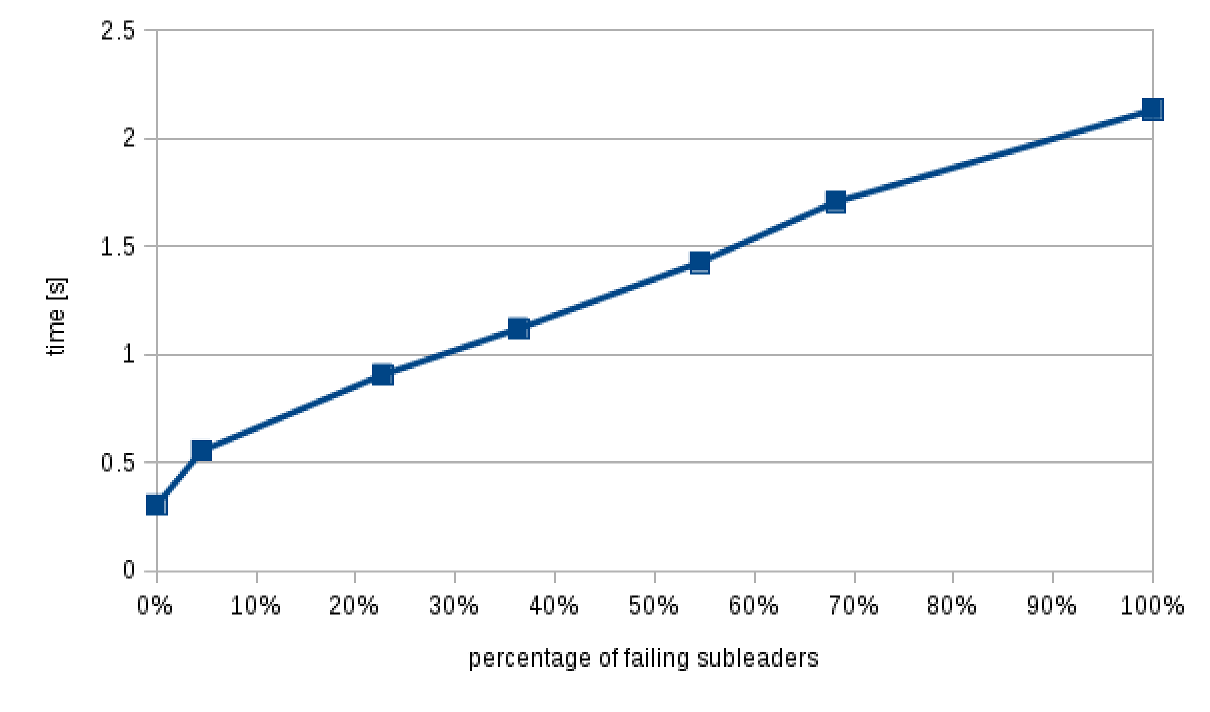
```
Test Results                              19s 732ms
    TestGenTreesRoot                          876ms
    TestGenTreesCount                         869ms
    TestGenTreesSubtrees                      863ms
    TestGenTreesComplete                      863ms
    TestGenTreesErrors                        620ms
    TestGenTreesRosterErrors                   22ms
    TestGenTreesUsesWholeRoster               386ms
    TestGenSubtreePutsCorrectSubleader   1s 112ms
    TestGenSubtreeStructure                   281ms
```

Simulation results : complete working tree



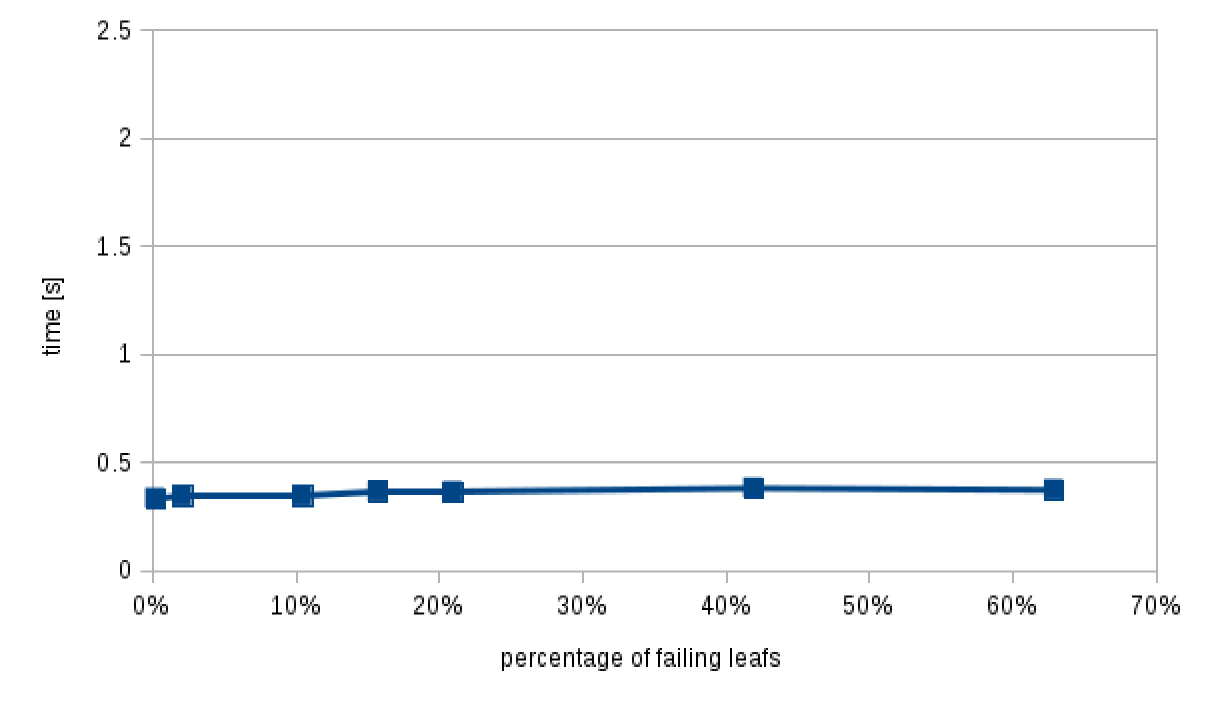
- 50ms delay, 10Mb/s bandwidth
- 4 machines, 4x24 threads, 2.5 GHz, 4x30MB cache, 4x256GB DDR4-2133 RAM

Simulation results : failing subleaders



- 500 nodes, ⌈√500⌉=22 subleaders
- 50ms delay, 10Mb/s bandwidth
- 4 machines, 4x24 threads, 2.5 GHz, 4x30MB cache, 4x256GB DDR4-2133 RAM

Simulation results : failing leafs



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Future work

- BFT-CoSi
- Handle root-node failure
- Handle finely nodes failures during runtime
- Extend unit tests
- Implement on a real blockchain
- Use ONet v2
- Use Omniledger’s Sharding Via Bias-Resistant Distributed Randomness

Conclusion

- Complete and working CoSi implementation with node failure
- Easy to use, with documentation and examples
- Lots of interest
- Scalable and tested
- Can still get better
- Personal improvement