ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

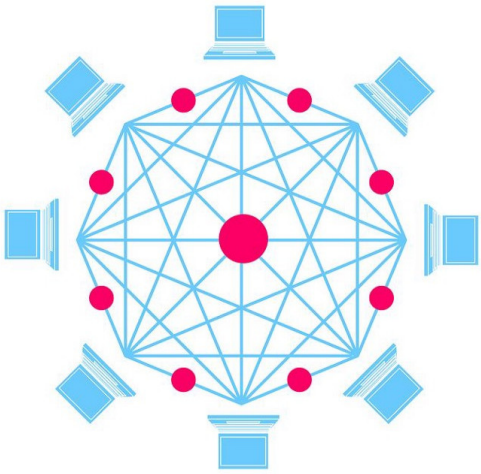
Distributed Computing

Prof. R. Wattenhofer

Asynchronous Consensus-Free Transaction Systems

In the distributed computing community, the *consensus* problem and its more practical counterpart, so-called state machine replication, have been extensively studied. More recently, such systems have regained attention by the name of *permissioned blockchain systems*. These permissioned blockchain systems have now become a prominent solution behind resilient, distributed applications. At their core, such systems assume that it is required to solve the consensus problem, thus preventing scalability. However, for many applications, such as payment systems, solving the consensus problem is not necessary.

In this thesis, you will develop and evaluate an asynchronous transaction system that pushes the boundaries of scalability by not aiming to solve the consensus problem. In other words, we will build a slightly restricted, but faster form of a permissioned blockchain system. By a *transaction system*, we understand a distributed protocol ensuring that no conflicting transactions can be executed simultaneously. The system will optimize the following evaluation criteria:



- **fault-tolerance:** It cannot be assumed that all engaging users behave honestly and follow the protocol.
- **speed:** Your system should be fast and scalable, e.g. to 10k transactions per second with 10k users.
- **dynamic:** Your system should be capable of evolving over time, e.g. allowing to exchange the set of validators.

While we already have some ideas how such an asynchronous transaction system might look, we are interested in your vision and input on how to build such a system.

Requirements: An interest in algorithmic problems is required. Programming experience in *python* is a great advantage. For this project, the student(s) should be able to solve basic implementation problems independently, while we discuss solutions / new ideas for upcoming problems in weekly meetings!

Contacts

- Roland Schmid: roschmi@ethz.ch, ETZ G94
- Jakub Sliwinski: jsliwinski@ethz.ch, ETZ G95