Chair of Network Architectures and Services
Department of Informatics
Technical University of Munich

Thesis M.Sc.

Performance Evaluation of Distributed Private Ledgers

Motivation

Blockchains are Peer-to-Peer systems that offer various highly interesting features like non-mutable and non-falsifiable storage of data. Bitcoin and Ethereum are two well known systems using Blockchain technology to keep track of financial transactions in a public distributed ledger.
Distributed ledgers are also of high interest in other scenarios. Think, for instance, of a highly secure and robust storage system for system (health) information extracted by software sensors from complex networked systems (cars, air crafts, etc.) for root cause analyses of incidents, etc. In the DecaADe (Decentralized Anomaly Detection, www.net.in.tum.de/sites/decade/) we work on this idea.
However, implementations of public Blockchains typically cannot be used in small private networks, as one component, the consensus algorithm, requires a very large number of competing nodes. This requirement is not fulfilled in private Blockchains where only dozens of nodes exist. By this reason, alternative Blockchain resp. distributed ledger implementations were created that use different consensus algorithms suitable for small private networks. Hyperledger (hyperledger.org) is one important example.

Approach

In this thesis we want to assess properties and performance of distributed ledger implementations using Hyperledger as an example. Your aim is to develop methods and tools. Interesting experiments include, for instance: **1)** How much traffic (packets, payload) is created by a running Blockchain network with n nodes that add m data sets per minute? **2)** How many data sets per minute ("throughput") can a network of n nodes handle? How are throughput and traffic affected when **3)** we increase the number of nodes in the network, **4)** artificially decrease the performance of the network (more lag, less bandwidth, etc.), or **5)** destabilize the network (more churn).

Your Tasks

1) Familiarize yourself with Blockchains and Hyperledger. **2)** Search and evaluate related work on benchmarking Blockchain or P2P networks. **3)** Setup a Hyperledger network in our virtualized test bed and create a test application able to write artificially generated system health information into the Blockchain. **4)** Design your experiments. **5)** Create tools able to conduct your experiments in the network automatically based upon our Chair's GPLMT tool set. **6)** Perform your experiments. **7)** Evaluate your experiments.

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