

# Peer to Peer Systems and Blockchains

## Academic Year 2017/2018

### Mid Term

### Analysing the Chord DHT

### Deadline 18-04-2018

The mid term consists in a study of the properties of the routing algorithm and of the topology of the Chord Distributed Hash Table [1].

The first part of the assignment requires to write a simulation of the Chord routing. The simulation takes as input the number of bits of the identifiers of a Chord ring and the number of nodes in the ring.

The simulation is defined by the following steps:

1. a centralized coordinator initializes a data structure containing the descriptors of the nodes belonging to the Chord network. In particular, the data structure stores, for each node, its SHA1 and its finger table. The information contained in the finger tables is also stored on a file in order to be used by an external analysis tool.
2. the coordinator generates, at random, a sequence of nodes identifiers and, for each node, the SHA1 of a random key. The coordinator simulates the Chord routing process for the look-up of each key. During the routing, some information is logged to allow its statistical analysis.
3. the information collected in step 2 are exploited to analyse some properties of the Chord routing (average number of routing hops, queries received by a node,...). Hint: you can use the DescriptiveStatistics class from the Apache Commons Math library to compute the main statistical measures.

After having conducted the simulation, the information stored in the file in step 1, is exploited to perform a set of analyses of the Chord topology. More in detail, the analyses should show which properties of the complex networks are also holding for the Chord topology network. To this aim, it is recommended to use the Cytoscape tool <http://www.cytoscape.org/>.

The assignment requires the submission of:

- the code of the simulation. (It is recommended to define the simulation in JAVA, even if other languages are accepted). Code should be adequately commented.
- a brief report describing the experiments and including:
  - a set of plots showing a set of statistical measures of the Chord routing
  - a set of plots showing a set of statistical measures of the Chord topology.

The assignment must be done individually and its deadline is 18 April 2018. If the evaluation of both the mid and of this final term will be positive, the student will be relieved from the oral exam. Submit the assignment through Moodle. Its evaluation will be notified through the Moodle as well.

The assignment is not mandatory, if it is not presented, the student will be required to pass the oral exam.

## References

- [1] *Chord: a scalable peer-to-peer lookup protocol for internet applications*, Ion Stoica, Robert Morris, David Liben-Nowell, David, David R. Karger, M Frans Kaashoek, Frank Dabek, Hari Balakrishnan, IEEE/ACM Transactions on Networking (TON), 11(1): 17-32 (2003).