

Chord Implementation

What is Working?

- **Chord Ring Setup:** Successful creation and configuration of the Chord ring based on the specified number of nodes.
- **Finger Table Initialization:** Each node accurately constructs its finger table according to the formulation provided in the research paper.

Notation	Definition
$finger[k]$	first node on circle that succeeds $(n + 2^{k-1}) \bmod 2^m, 1 \leq k \leq m$
$successor$	the next node on the identifier circle; $finger[1].node$
$predecessor$	the previous node on the identifier circle

TABLE I

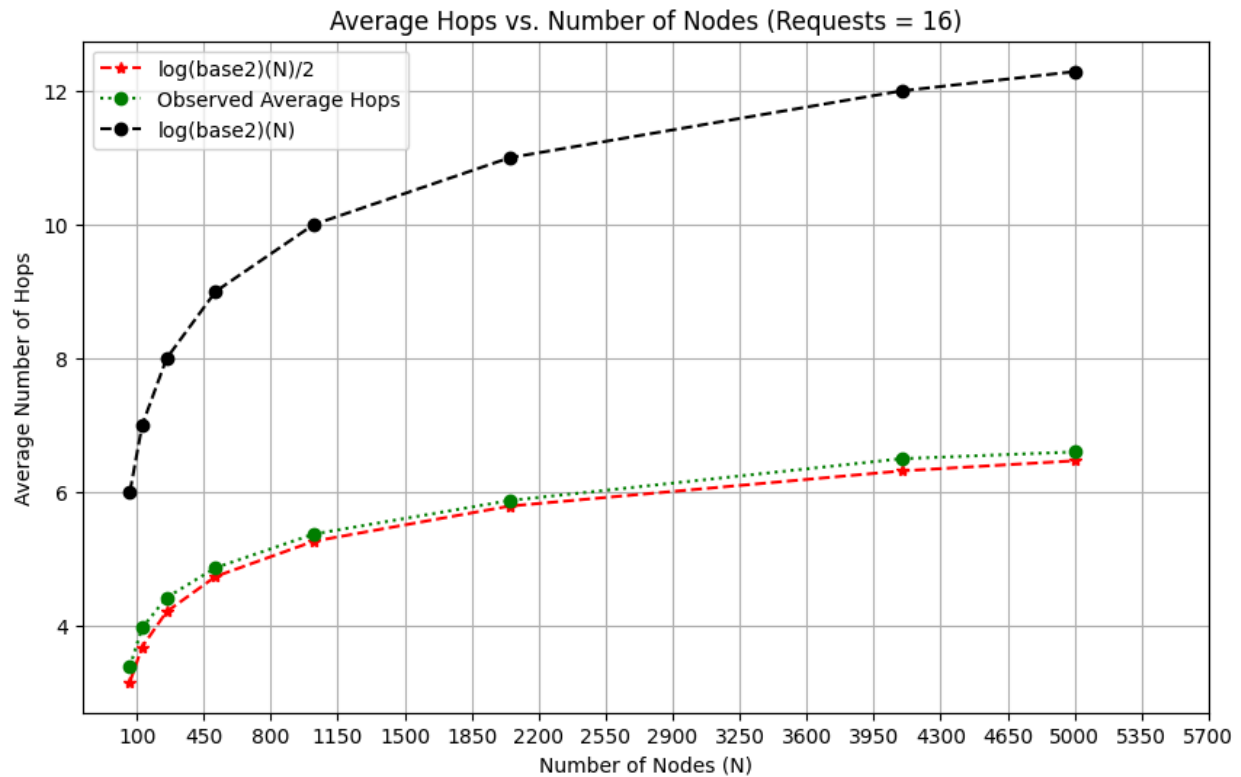
Definition of variables for node n , using m -bit identifiers.

- **Network Join and Routing:** Network joining and message routing are implemented as outlined in Section 4 of the paper.
- **Efficient Distributed Key Lookup:** Key-based search operates with logarithmic time complexity in the worst case and achieves about half the logarithmic complexity on average, making lookups scalable with larger nodes
- **Actor-Based Node Implementation:** Each node in the peer network is represented as an independent actor, enabling scalable, concurrent processing across the network.

Network Behaviour:

- We tested the average hops with varying the number of nodes as [16, 32, 64, 128, 256, 512, 1024, 2048, 4096] with 16 requests by each node.
- The average hop is about half the logarithmic number of nodes.
- This corroborates with the outcome of the paper as discussed in sec 5.D position and the key. Thus the average path length will be about $\frac{1}{2} \log_2 N$.

- The following is the graph of the average hop vs number of nodes.



Largest Network Tested

- The largest network tested is 32,000 nodes with 8 requests.
- Average Hops for this network: 7.488

The only limitation is hardware constraints; the algorithm itself is optimized to handle larger numbers of nodes and requests efficiently.

Instructions to run

- Unzip the project3 file.
- To compile run ponyc
- Then use the following command to run the code
project3 <number of nodes> <number of requests>