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# Component Description

In this project, we have implemented a distributed, peer-to-peer Book Finder System, using a distributed hash table (DHT) based on the chord protocol. With this system

There are 3 main components in this system:

## SuperNode

* SuperNode is a well-known node in the DHT. Each node in the DHT knows the IP address and port of SuperNode when it starts.
* The join process is synchronized, which means each node who requests to join the network will get an “NACK” response until the SuperNode releases its synchronization lock.

## Nodes

* For each node in the system, it has its own ID, IP address and port. Also, it will store its FingerTable information about the DHT, and its predecessor and successor.
* When a node tries to join the DHT, it will connect to the SuperNode first and get its IP+port hashed by SHA-1 hash function to achieve a unique ID. Then ID will be modded (i.e., id % numDHT) to make sure that it falls into the range [0, 2^m-1], where m is the number of rows in a FingerTable.
* When the client runs, the SuperNode will return a random node to the client for only once. Then, the client would contact the given node and do the Get() and Set() operations.

## Client

The client will provide 5 options. When you run Client, it will first print all the available commands on the screen and you can follow the hints to do the operation you want.

* Set
  + This operation is used for setup the all the records (<book: genre> pairs) to the DHT from a given txt file.
  + The Set option will have 2 conditions, with the 0/1 parameter. If you type in Set/0, then the path would not be printed. If you type in Set/1, and the path information would be printed on the screen.
* Get
  + When you type the title of a book through the command line, the system will look up for this book and return the genre of this book on the screen. If this book does not exist in the system, some message will be printed on the screen to alert you about this.
  + The Get option also works in 2 conditions with 0/1 parameter, which is quite similar to the Set option.
* Insert (Update)
  + You can insert any record to the DHT, as you type the correct format of a record ([book title]: [genre]). If the book is already in the DHT, then the DHT will update the genre of this book.
* Print
  + By typing “Print” command through the command line, the information of all nodes in the system will be printed. You can see the ID of each node, its predecessor and successor, and all the <book: genre> records saved on this node.
* Exit
  + After you type the “Exit” command, you will quit the system safely.

System Implementation

## SuperNode

Three main methods are implemented in the SuperNode.

* Join(IP, Port)

To join the DHT, a node must contact the SuperNode first, using thrift. Then one of nodes information will be returned to the node to help build DHT. If the SuperNode is busy in join process of another node, it will return an “NACK” to the requesting node.

* PostJoin(IP, Port)

After a node has joined the DHT, it will notify the SuperNode. When the SuperNode receives this “done” message, the SuperNode will release its synchrona

* GetNode()

If a client wants to contact a node in the DHT, the SuperNode would return a random node to the client first. The client will contact the SuperNode only once.

## Node

We have also implemented three main methods in the Node part.

* Set(Book\_title, Genre)

This function is implemented by calling method insertRecord\_ByKey(int key, String title, String genre) in a while-loop. When the client communicates the SuperNode, SuperNode will return a node to the client randomly by the GetNode() method. Then the client tries to communicate the given node. For a given key of a book title, which is hashed by SHA-1, we could find its successor, which is a recursive process.

The .txt file will be read using a bufferedreader and each line of the .txt file is a record. In a while-loop, the insertRecord\_ByKey method will be called to insert each record to the successor node’s hash table.

* Get(Book\_title)

This function is implemented by calling method lookupBook\_ByKey(int key, String title). Still, after communication between the client and node has been set up, for a given key of a book title, the key will find its successor, which is a recursive process. Then we will search the hash table in the successor node to find the value (genre) of a given title. Then the genre would be returned to the client and printed on the screen. If the book does not exist in the DHT, some error message will be printed to inform you about this.

* UpdateDHT()

When a node has joined DHT, this node will contact other nodes in the FingerTable to let them update DHT. When the node finishes calling to all nodes, it will let the SuperNode know that it is done to join by calling PostJoin().

# System Setup and Execution

## Compile

You may run the .sh first to compile the files.

* ./make.sh

After that, you may start the SuperNode, Node and Client. You may change the number of nodes on the chord ring by change the [maxNumNodes] parameter through the command line. Generally, we will specify that there are 5 nodes on the chord ring. The total number of identifiers on the chord ring is adjusted to the [maxNumNodes] parameter, which is the least power of two larger than maxNumNodes. For example, if there are 5 nodes in the system, there should be 8 identifiers on the chord ring.

## Execute

You may execute the code like this:

For SuperNode

* java -cp ".:/usr/local/Thrift/\*" SuperNode 5 9001
* parameter format: [maxNumNodes] [port]

For Node

* java -cp ".:/usr/local/Thrift/\*" NodeDHT 9002 5 localhost 9001
* java -cp ".:/usr/local/Thrift/\*" NodeDHT 9003 5 localhost 9001
* java -cp ".:/usr/local/Thrift/\*" NodeDHT 9004 5 localhost 9001
* java -cp ".:/usr/local/Thrift/\*" NodeDHT 9005 5 localhost 9001
* java -cp ".:/usr/local/Thrift/\*" NodeDHT 9006 5 localhost 9001
* parameter format: [NodePort] [maxNumNodes] [SuperNode IP] [SuperNode port]

For Client

* java -cp ".:/usr/local/Thrift/\*" Client localhost 9001 5
* parameter format: [SuperNode IP] [SuperNode port] [maxNumNodes]

# Testcases

## Positive testcases

Generally we will use the given shakespeares.txt file as our positive testcase.

## SuperNode

|  |
| --- |
| 5 |
|  | 5 |
|  | 0/ |
|  | 9001 |
|  | 5 |
|  | 0 |
|  | \*\*\* Node Initation Call: Connection from localhost |
|  | Generated ID: 5 for requesting node |
|  | nodeList.length: 8 |
|  | nodeList[nodeID]: null |
|  | New node added ... |
|  | 5/5/localhost/9002 |
|  | \*\*\* Post Initiation Call: Node 5 is in the DHT. |
|  | Current number of nodes = 1 |
|  |  |
|  | 5 |
|  | 1 |
|  | \*\*\* Node Initation Call: Connection from localhost |
|  | Generated ID: 3 for requesting node |
|  | nodeList.length: 8 |
|  | nodeList[nodeID]: null |
|  | New node added ... |
|  | 3/5/localhost/9002 |
|  | \*\*\* Post Initiation Call: Node 3 is in the DHT. |
|  | Current number of nodes = 2 |
|  |  |
|  | 5 |
|  | 2 |
|  | \*\*\* Node Initation Call: Connection from localhost |
|  | Generated ID: 6 for requesting node |
|  | nodeList.length: 8 |
|  | nodeList[nodeID]: null |
|  | New node added ... |
|  | 6/3/localhost/9003 |
|  | \*\*\* Post Initiation Call: Node 6 is in the DHT. |
|  | Current number of nodes = 3 |
|  |  |
|  | 5 |
|  | 3 |
|  | \*\*\* Node Initation Call: Connection from localhost |
|  | Generated ID: 4 for requesting node |
|  | nodeList.length: 8 |
|  | nodeList[nodeID]: null |
|  | New node added ... |
|  | 4/6/localhost/9004 |
|  | \*\*\* Post Initiation Call: Node 4 is in the DHT. |
|  | Current number of nodes = 4 |
|  |  |
|  | 5 |
|  | 4 |
|  | \*\*\* Node Initation Call: Connection from localhost |
|  | Generated ID: 3 for requesting node |
|  | nodeList.length: 8 |
|  | nodeList[nodeID]: Node(ID:3, IP:localhost, Port:9003, Trace:3) |
|  | while loop |
|  | ID Collision, new ID: 3 |
|  | while loop |
|  | ID Collision, new ID: 1 |
|  | New node added ... |
|  | 1/6/localhost/9004 |
|  | \*\*\* Post Initiation Call: Node 1 is in the DHT. |
|  | Current number of nodes = 5 |

## Node1

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Connecting to SuperNode |
|  | My IP: 128.101.35.175 |
|  |  |
|  | I got my ID and a node to contact!!!!! 5/5/localhost/9002 |
|  | My given Node ID is: 5. Predecessor ID: 5 |
|  | Building Finger table ... |
|  | 4 |
|  | =============init finger table============================ |
|  | finger[1] succ id 5 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 5 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 5 |
|  | finger[3] start id 1 |
|  | =============init finger table============================ |
|  | Done, all finger tablet set as me (only node in DHT) |
|  | Listening for connection from Client or other Nodes... |
|  | 9002 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 3 |
|  | =============update finger table========================== |
|  | finger[1] succ id 3 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 5 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 5 |
|  | finger[3] start id 1 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | =============update finger table========================== |
|  | finger[1] succ id 3 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 3 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 5 |
|  | finger[3] start id 1 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | =============update finger table========================== |
|  | finger[1] succ id 3 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 3 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 1 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | =============update finger table========================== |
|  | finger[1] succ id 6 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 3 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 1 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 1 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | =============update finger table========================== |
|  | finger[1] succ id 6 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 1 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 1 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | =============update finger table========================== |
|  | finger[1] succ id 6 |
|  | finger[1] start id 6 |
|  | finger[2] succ id 1 |
|  | finger[2] start id 7 |
|  | finger[3] succ id 1 |
|  | finger[3] start id 1 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_succ: I am now at nodeID: 5 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 -> 4 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 1 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 1 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 -> 4 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 -> 4 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 -> 4 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 1 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 1 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 5 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |
|  | in find\_pred: I am now at nodeID: 5 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 5 -> 6 |

## Node2

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Connecting to SuperNode |
|  | My IP: 128.101.35.175 |
|  |  |
|  | I got my ID and a node to contact!!!!! 3/5/localhost/9002 |
|  | My given Node ID is: 3. Predecessor ID: 5 |
|  | Building Finger table ... |
|  | Asking node 5 at localhost |
|  | Listening for connection from Client or other Nodes... |
|  | 9003 |
|  | =============init finger table============================ |
|  | finger[1] succ id 5 |
|  | finger[1] start id 4 |
|  | finger[2] succ id 5 |
|  | finger[2] start id 5 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 7 |
|  | =============init finger table============================ |
|  |  |
|  | Initiated Finger Table! |
|  | in find\_pred: I am now at nodeID: 3 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 2 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 5 |
|  | Updated all other nodes! |
|  | in find\_succ: I am now at nodeID: 3 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 6 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 6 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 5 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | =============update finger table========================== |
|  | finger[1] succ id 4 |
|  | finger[1] start id 4 |
|  | finger[2] succ id 5 |
|  | finger[2] start id 5 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 7 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 4 |
|  | =============update finger table========================== |
|  | finger[1] succ id 4 |
|  | finger[1] start id 4 |
|  | finger[2] succ id 5 |
|  | finger[2] start id 5 |
|  | finger[3] succ id 1 |
|  | finger[3] start id 7 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 3 to find key: 4 |

## Node3

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Connecting to SuperNode |
|  | My IP: 128.101.35.175 |
|  |  |
|  | I got my ID and a node to contact!!!!! 6/3/localhost/9003 |
|  | My given Node ID is: 6. Predecessor ID: 3 |
|  | Building Finger table ... |
|  | Asking node 3 at localhost |
|  | Listening for connection from Client or other Nodes... |
|  | 9004 |
|  | =============init finger table============================ |
|  | finger[1] succ id 3 |
|  | finger[1] start id 7 |
|  | finger[2] succ id 3 |
|  | finger[2] start id 0 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 2 |
|  | =============init finger table============================ |
|  |  |
|  | Initiated Finger Table! |
|  | in find\_pred: I am now at nodeID: 6 to find key: 6 |
|  | in find\_predecessor, result2.getTrace(): 6 -> 3 -> 5 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 6 -> 3 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 3 |
|  | Updated all other nodes! |
|  | in find\_succ: I am now at nodeID: 6 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 6 -> 3 |
|  | in find\_succ: I am now at nodeID: 6 to find key: 6 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 6 |
|  | in find\_predecessor, result2.getTrace(): 6 -> 3 -> 5 |
|  | in find\_succ: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 1 |
|  | in find\_succ: I am now at nodeID: 6 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 2 |
|  | in find\_succ: I am now at nodeID: 6 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 6 -> 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 1 |
|  | =============update finger table========================== |
|  | finger[1] succ id 1 |
|  | finger[1] start id 7 |
|  | finger[2] succ id 3 |
|  | finger[2] start id 0 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 2 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | =============update finger table========================== |
|  | finger[1] succ id 1 |
|  | finger[1] start id 7 |
|  | finger[2] succ id 1 |
|  | finger[2] start id 0 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 2 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 1 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 0 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 1 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 7 |
|  | in find\_succ: I am now at nodeID: 6 to find key: 4 |
|  | in find\_pred: I am now at nodeID: 6 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 6 -> 3 |

## Node4

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Connecting to SuperNode |
|  | My IP: 128.101.35.175 |
|  |  |
|  | I got my ID and a node to contact!!!!! 4/6/localhost/9004 |
|  | My given Node ID is: 4. Predecessor ID: 6 |
|  | Building Finger table ... |
|  | Asking node 6 at localhost |
|  | Listening for connection from Client or other Nodes... |
|  | 9005 |
|  | =============init finger table============================ |
|  | finger[1] succ id 5 |
|  | finger[1] start id 5 |
|  | finger[2] succ id 6 |
|  | finger[2] start id 6 |
|  | finger[3] succ id 3 |
|  | finger[3] start id 0 |
|  | =============init finger table============================ |
|  |  |
|  | Initiated Finger Table! |
|  | in find\_pred: I am now at nodeID: 4 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 4 -> 3 |
|  | in find\_pred: I am now at nodeID: 4 to find key: 3 |
|  | in find\_predecessor, result2.getTrace(): 4 -> 6 |
|  | in find\_pred: I am now at nodeID: 4 to find key: 1 |
|  | in find\_predecessor, result2.getTrace(): 4 -> 6 |
|  | Updated all other nodes! |
|  | in find\_pred: I am now at nodeID: 4 to find key: 5 |
|  | =============update finger table========================== |
|  | finger[1] succ id 5 |
|  | finger[1] start id 5 |
|  | finger[2] succ id 6 |
|  | finger[2] start id 6 |
|  | finger[3] succ id 1 |
|  | finger[3] start id 0 |
|  | =============update finger table========================== |
|  |  |
|  | in find\_pred: I am now at nodeID: 4 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 4 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 4 to find key: 5 |
|  | in find\_pred: I am now at nodeID: 4 to find key: 5 |

## Node5

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Connecting to SuperNode |
|  | My IP: 128.101.35.175 |
|  |  |
|  | I got my ID and a node to contact!!!!! 1/6/localhost/9004 |
|  | My given Node ID is: 1. Predecessor ID: 6 |
|  | Building Finger table ... |
|  | Asking node 6 at localhost |
|  | Listening for connection from Client or other Nodes... |
|  | 9006 |
|  | =============init finger table============================ |
|  | finger[1] succ id 3 |
|  | finger[1] start id 2 |
|  | finger[2] succ id 3 |
|  | finger[2] start id 3 |
|  | finger[3] succ id 5 |
|  | finger[3] start id 5 |
|  | =============init finger table============================ |
|  |  |
|  | Initiated Finger Table! |
|  | in find\_pred: I am now at nodeID: 1 to find key: 1 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 5 -> 6 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 0 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 5 -> 6 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 6 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 5 |
|  | Updated all other nodes! |
|  | in find\_pred: I am now at nodeID: 1 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 5 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 -> 4 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 2 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 4 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 3 |
|  | in find\_succ: I am now at nodeID: 1 to find key: 7 |
|  | in find\_pred: I am now at nodeID: 1 to find key: 7 |
|  | in find\_predecessor, result2.getTrace(): 1 -> 5 -> 6 |

## Client

When the system has been set up, you would see the options listed on the Client terminal, which is shown as the following:

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* System starts \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Please specify the operation that you want this system to execute: |
|  | Please specify (0 or 1) for Set and Get, if you would like to print path. e,g 'Get/1' will print the path, 'Get/0' won't |
|  | Set - Setting a book title and its genre from a given file. |
|  | Get - Looking up a book title for its genre. |
|  | Insert - Inserting a new record to the system or updating the genre for a existing book. |
|  | Print - Printing the information of all nodes. |
|  | Exit - Exiting from the system. |

|  |
| --- |
|  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

We will test all the options provided in turn

* Set

Set/1

|  |
| --- |
| Set/1 |
|  | the contact point id: 5 |
|  | Please input the path of the given file: |
|  | ./shakespeares.txt |
|  | insert All's Well That Ends Well success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 2 |
|  | insert As You Like It success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert The Comedy of Errors success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 3 |
|  | insert Love's Labor's Lost success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 0 |
|  | insert Measure for Measure success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 7 |
|  | insert The Merchant of Venice success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert The Merry Wives of Windsor success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 7 |
|  | insert A Midsummer Night's Dream success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 0 |
|  | insert Much Ado About Nothing success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 0 |
|  | insert The Taming of the Shrew success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 -> 6 -> 3 -> 5 -> 5 |
|  | the key to insert: 5 |
|  | insert Twelfth Night success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 3 |
|  | insert The Two Gentlemen of Verona success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 0 |
|  | insert The Two Noble Kinsmen success, this insertion has go through the path: |
|  | 5 -> 6 |
|  | the key to insert: 6 |
|  | insert Henry IV, Part 1 success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 7 |
|  | insert Henry IV, Part 2 success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 1 |
|  | insert Henry V success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 2 |
|  | insert Henry VI, Part 1 success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 -> 6 -> 3 -> 5 -> 5 |
|  | the key to insert: 5 |
|  | insert Henry VI, Part 2 success, this insertion has go through the path: |
|  | 5 -> 6 |
|  | the key to insert: 6 |
|  | insert Henry VI, Part 3 success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 3 |
|  | insert Henry VIII success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 2 |
|  | insert King John success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert Richard II success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert Richard III success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 0 |
|  | insert Antony and Cleopatra success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 2 |
|  | insert Coriolanus success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 7 |
|  | insert Hamlet success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 7 |
|  | insert Julius Caesar success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert King Lear success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 3 |
|  | insert Macbeth success, this insertion has go through the path: |
|  | 5 -> 6 |
|  | the key to insert: 6 |
|  | insert Othello success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 3 |
|  | insert Romeo and Juliet success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 0 |
|  | insert Timon of Athens success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 -> 6 -> 3 -> 5 -> 5 |
|  | the key to insert: 5 |
|  | insert Titus Andronicus success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert Troilus and Cressida success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 -> 6 -> 3 -> 5 -> 5 |
|  | the key to insert: 5 |
|  | insert Cymbeline success, this insertion has go through the path: |
|  | 5 -> 6 |
|  | the key to insert: 6 |
|  | insert Pericles success, this insertion has go through the path: |
|  | 5 -> 6 |
|  | the key to insert: 6 |
|  | insert The Tempest success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 2 |
|  | insert The Winter's Tale success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |
|  | insert Lucrece success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 7 |
|  | insert The Phoenix and Turtle success, this insertion has go through the path: |
|  | 5 -> 1 -> 6 -> 3 -> 5 -> 3 |
|  | the key to insert: 2 |
|  | insert Sonnets success, this insertion has go through the path: |
|  | 5 -> 6 -> 1 |
|  | the key to insert: 1 |
|  | insert Venus and Adonis success, this insertion has go through the path: |
|  | 5 -> 1 -> 3 -> 4 |
|  | the key to insert: 4 |

Set/0

* Get

Get/1

|  |
| --- |
| Get/1 |
|  | the contact point id: 5 |
|  | Please input the book title you want to look up: |
|  | The Merchant of Venice |
|  | The result of your search is: Comedies |
|  | path: 5 -> 1 -> 3 -> 4 |

Get/0

|  |
| --- |
| Get/0 |
|  | the contact point id: 5 |
|  | Please input the book title you want to look up: |
|  | The Merchant of Venice |
|  | The result of your search is: Comedies |

* Insert

|  |
| --- |
| Insert |
|  | the contact point id: 5 |
|  | Please input the book title and genre pair: |
|  | Zongshun:Student |
|  | insert Zongshun success |
|  |  |
|  |  |
|  |  |
|  | \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* System starts \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Please specify the operation that you want this system to execute: |
|  | Please specify (0 or 1) for Set and Get, if you would like to print path. e,g 'Get/1' will print the path, 'Get/0' won't |
|  | Set - Setting a book title and its genre from a given file. |
|  | Get - Looking up a book title for its genre. |
|  | Insert - Inserting a new record to the system or updating the genre for a existing book. |
|  | Print - Printing the information of all nodes. |
|  | Exit - Exiting from the system. |
|  |  |
|  |  |
|  |  |
|  | Get/1 |
|  | the contact point id: 1 |
|  | Please input the book title you want to look up: |
|  | Zongshun |
|  | The result of your search is: Student |
|  | path: 1 -> 5 -> 6 -> 1 |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  | \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* System starts \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Please specify the operation that you want this system to execute: |
|  | Please specify (0 or 1) for Set and Get, if you would like to print path. e,g 'Get/1' will print the path, 'Get/0' won't |
|  | Set - Setting a book title and its genre from a given file. |
|  | Get - Looking up a book title for its genre. |
|  | Insert - Inserting a new record to the system or updating the genre for a existing book. |
|  | Print - Printing the information of all nodes. |
|  | Exit - Exiting from the system. |
|  |  |
|  |  |
|  |  |
|  | Get/1 |
|  | the contact point id: 6 |
|  | Please input the book title you want to look up: |
|  | tttttttttttttttttttttt |
|  | Sorry the book queried is not in the DHT |

* Print

|  |
| --- |
| Print |
|  | the contact point id: 1 |
|  | =============================================================== |
|  | I am node with nodeID 1. my predecesor is node with nodeID 6. |
|  |  |
|  |  |
|  | my partial hash table is listed below |
|  | Love's Labor's Lost: Comedies |
|  | Hamlet: Tragedies |
|  | The Two Gentlemen of Verona: Comedies |
|  | Lucrece: Poems |
|  | Richard III: Histories |
|  | Henry IV, Part 1: Histories |
|  | Coriolanus: Tragedies |
|  | Henry IV, Part 2: Histories |
|  | Zongshun: Student |
|  | Sonnets: Poems |
|  | Measure for Measure: Comedies |
|  | A Midsummer Night's Dream: Comedies |
|  | Romeo and Juliet: Tragedies |
|  | Much Ado About Nothing: Comedies |
|  | The Merry Wives of Windsor: Comedies |
|  |  |
|  |  |
|  | =============================================================== |
|  |  |
|  | =============================================================== |
|  | I am node with nodeID 6. my predecesor is node with nodeID 5. |
|  |  |
|  |  |
|  | my partial hash table is listed below |
|  | Henry VI, Part 2: Histories |
|  | Macbeth: Tragedies |
|  | Pericles: Romances |
|  | Cymbeline: Romances |
|  | The Two Noble Kinsmen: Comedies |
|  |  |
|  |  |
|  | =============================================================== |
|  |  |
|  | =============================================================== |
|  | I am node with nodeID 5. my predecesor is node with nodeID 4. |
|  |  |
|  |  |
|  | my partial hash table is listed below |
|  | Troilus and Cressida: Tragedies |
|  | Henry VI, Part 1: Histories |
|  | Timon of Athens: Tragedies |
|  | The Taming of the Shrew: Comedies |
|  |  |
|  |  |
|  | =============================================================== |
|  |  |
|  | =============================================================== |
|  | I am node with nodeID 4. my predecesor is node with nodeID 3. |
|  |  |
|  |  |
|  | my partial hash table is listed below |
|  | Venus and Adonis: Poems |
|  | As You Like It: Comedies |
|  | Richard II: Histories |
|  | Titus Andronicus: Tragedies |
|  | King John: Histories |
|  | Julius Caesar: Tragedies |
|  | The Merchant of Venice: Comedies |
|  | The Winter's Tale: Romances |
|  |  |
|  |  |
|  | =============================================================== |
|  |  |
|  | =============================================================== |
|  | I am node with nodeID 3. my predecesor is node with nodeID 1. |
|  |  |
|  |  |
|  | my partial hash table is listed below |
|  | Henry VI, Part 3: Histories |
|  | The Comedy of Errors: Comedies |
|  | Antony and Cleopatra: Tragedies |
|  | Henry V: Histories |
|  | All's Well That Ends Well: Comedies |
|  | Othello: Tragedies |
|  | The Phoenix and Turtle: Poems |
|  | Twelfth Night: Comedies |
|  | King Lear: Tragedies |
|  | The Tempest: Romances |
|  | Henry VIII: Histories |
|  |  |
|  |  |
|  | =============================================================== |

* Exit

|  |
| --- |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* System starts \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |
|  | Please specify the operation that you want this system to execute: |
|  | Please specify (0 or 1) for Set and Get, if you would like to print path. e,g 'Get/1' will print the path, 'Get/0' won't |
|  | Set - Setting a book title and its genre from a given file. |
|  | Get - Looking up a book title for its genre. |
|  | Insert - Inserting a new record to the system or updating the genre for a existing book. |
|  | Print - Printing the information of all nodes. |
|  | Exit - Exiting from the system. |
|  |  |
|  |  |
|  |  |
|  | Exit |
|  | the contact point id: 6 |
|  | \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* System ends \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* |

## Negative testcases

* File does exist

|  |  |
| --- | --- |
|  | Please specify (0 or 1) for Set and Get, if you would like to print path. e,g 'Get/1' will print the path, 'Get/0' won't |
|  | Set - Setting a book title and its genre from a given file. |
|  | Get - Looking up a book title for its genre. |
|  | Insert - Inserting a new record to the system or updating the genre for a existing book. |
|  | Print - Printing the information of all nodes. |
|  | Exit - Exiting from the system. |
|  |  |
|  |  |
|  |  |
|  | Set/1 |
|  | the contact point id: 6 |
|  | Please input the path of the given file: |
|  | sdjfasoghsghjsghsaogjsaghsg |
|  | File does not exist. Please input the correct file path. |

* No Book found in the DHT

|  |
| --- |
|  |
| Get/1 |
|  | the contact point id: 1 |
|  | Please input the book title you want to look up: |
|  | jksfhuisahfuiahgjk |
|  | Sorry the book queried is not in the DHT |
|  |  |

* Wrong input command

|  |  |
| --- | --- |
|  | Please specify (0 or 1) for Set and Get, if you would like to print path. e,g 'Get/1' will print the path, 'Get/0' won't |
|  | Set - Setting a book title and its genre from a given file. |
|  | Get - Looking up a book title for its genre. |
|  | Insert - Inserting a new record to the system or updating the genre for a existing book. |
|  | Print - Printing the information of all nodes. |
|  | Exit - Exiting from the system. |
|  |  |
|  |  |
|  |  |
|  | jksdfjksbh |
|  | the contact point id: 4 |
|  | Invalid command. Please use the operations listed above. |
|  |  |

* Improper insert format

|  |
| --- |
|  |
| Insert/1 |
|  | the contact point id: 1 |
|  | Please input the book title and genre pair: |
|  | sdfsaj |
|  | Improper format. Please check your input pair. |
|  |  |