Csci 5105 PA2

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System Achitecture

The book finder system consist of following 3 components:

Super Node

This system has only one super node which plays a role as a coordinator. All nodes in this system is known by the super node. But the super node only stores the IP addresses, port and node key of nodes. The super node is mainly responsible for 2 jobs, one is node joining and one is assign node to the client. After all nodes are joined this system, the super node can provide node assignment service for the client. Each time the super node receive a request from a client, it randomly assign a node to the client.

Node

A node is a actual worker in this system. Each node contains information(IP address, port, key) of its predecessor and its successor and a finger table.

Once a node wants to joint this system, it first sends request to the super node and super node will return an existing node in this system to help the node join this system. A node can use the assigned node to find its predecessor and its successor and initialize its finger table. Then it sends notification to some nodes which might be affected to ask them to update their finger tables.

After all nodes joined this system, they can provide get book genre and set book genre service to the client.

Client

A client requests service from this system. A client first sends requests to the super node and gets an assigned node. Then sends requests to the node to get set book genre or get book genre service.

User Guide

- **Run super node**

1. Run the java file.

```
java -cp ".:/usr/local/Thrift/*" SNode
```

2. Then in your terminal, the following message will display:

```
Please enter the node number of the DHT:
```

You can enter the number of nodes.

3. Then in your terminal, the following message will display:

```
Please enter the size of the DHT: (eg.: enter 5 for a DHT with 2^5 =
32 entries.)
```

You can enter the size of DHT.

4. Then in your terminal, the following message will display:

```
Now the super node has ip [your machine ip].
Please enter the port of the super node:
```

You can enter a valid port number.

4. Now you successfully set up your super node, then each time a node join the DHT, if the number of nodes in the DHT does not meet the number you set in step 2, in your terminal, the following message will display:

```
Still need [number] nodes to finish the DHT.
```

If the number is met, in your terminal, the following message will display:

```
All nodes have been joined in to the DHT, you can do get or set
operation in the client node now.
```

- **Run nodes**

1. Run the java file.

```
java -cp ".:/usr/local/Thrift/*" Node
```

2. Then in your terminal, the following message will display:

```
The current ip address of this computer is [your machine ip].
Please enter super node's ip:
```

You can enter the ip address of the super node.

3. Then in your terminal, the following message will display:

```
Plese enter super node's port:
```

You can enter the port number of the super node.

4. Then in your terminal, the following message will display:

```
Please enter your port:
```

You can enter a valid port number.

5. If your node join the DHT successfully, in your terminal, the following message will display:

```
Calling the post joining function now to end joining.
You can type 'show' any time to see the information of the node
```

6. After the message displayed in step 5, you can enter show any time to display the current node state.

```
show
```

- **Run client**

  1. Run the java file

     ```
     java -cp ".:/usr/local/Thrift/*" Client
     ```

  2. Then in your terminal, the following message will display:

     ```
     Please enter super node's ip:
     ```

     You can enter the ip address of the super node.

3. Then in your terminal, the following message will display:

```
Plese enter super node's port:
```

You can enter the port number of the super node.

4. Then in your terminal, the following message will display:

```
The starting node that super node assigned to you has ip: [node ip]
and the port is [node port].
Select you operation (set/get):
```

You can enter set for setting book's genre. Or you can enter get for getting book's genre.

If you enter others, in your terminal, the following message will display:

```
Wrong operation mode, please select again(set/get)
```

Then you can enter operation mode again, until correct operation mode is entered.

5. Then in your terminal, the following message will display:

```
Do you want to print the log file of your set/get operation? (enter
'y' if you want the log file)
```

You can enter **y** if you want the log file. Or you can enter any other if you don't.

6. If you enter **set**, then in your terminal, the following message will display:

```
In set mode.
Select you set mode (file/input)
```

You can enter file, which stands for using a file as input. Or you can enter input, which stands for entering input in terminal.

If you enter others, in your terminal, the following message will display:

```
Wrong set mode, please select again(file/input)
```

7. If you enter **set** and **file**, then in your terminal, the following message will display:

```
In file mode of setting.
Please enter the location of your file:
```

You can enter a valid file path. If you enter wrong file path, in your terminal, the following message will display:

```
what you have just entered is not a file, please enter again:
```

Then you can enter file path again until correct path is entered.

- We assume that the book information saved in the file has format of "book title: book genre". If the ":" is missing in one line of the input file, the command line will print:

```
The genre part of book <[book name]> is missing
```

And the genre part of the book information will be set to "missing".

- If you choose to display the log file previously, the client will print the log information about what nodes are visited during the setting.

```
This is the log information of setting <[book name]> of genre
[genre] to the DHT is:
This set operation has visited these nodes: node with key x node
with key y...
Setting finished.
```

8. If you enter **set** and **input**, then in your terminal, the following message will display:

```
In input mode of setting.
Please enter the book's name you are setting:
```

You can enter the book name.

Then in your terminal, the following message will display:

```
Please enter the book's genre you are setting:
```

You can enter the book genre.

The output in this case is the same as step 7.

9. If you enter **get**, then in your terminal, the following message will display:

```
In get mode.
Please enter the book name
```

If you choose to display the log file previously, the client will print the log information as mentioned in step 7.

If the book is found, then in your terminal, the following message will display:

```
The genre of <[book name]> is [genre].
```

Otherwise, it will display

```
Sorry, not find the genre of <[book]>.
```

Testing Description

In this section, we test correct component setup (super node, node, and client) and get/set operation. We also test possible cases that messages entered by users are unexpected. The common exceptions, including wrong IP address and wrong port number are not covered in this section.

- Positive test case: super node setup and node joining. During node joining, the console of super node displays the current number of nodes and their keys. Also it display how many nodes needed for this DHT.

- Negative case: the node key calculated by super node might has collision. When the super node detects the collision, it re-calculates the key. (No sceenshot for this case)

- Positive test case: node set up and finger table updating. Each time the finger table is updated, the console of the node displays the current finger table.

- Negative test case: node tries to join the DHT which has enough nodes, both console of the node and super node display exception that this node cannot join because there are too many nodes.

(screenshot of console of the node)

(screenshot of console of the super node)

- Positive test case: client set up. It displays the node assigned to the client.

- Positive test case: set operation & file mode. It displays book name, book genre, and log file(visited nodes) for each book-genre pair in the input file.

```
                        yyc@yyc-P65xHP: ~/Downloads/csci5015/DHT/code
File Edit View Search Terminal Help
set
Do you want to print the log file of your set/get operation? (enter 'y' if you want the log file.)
y
In set mode.
Select your set mode (file/input):
file
In file mode of setting.
Please enter the location of your file:
../data/shakespeares.txt
Setting the book: All's Well That Ends Wellof genre: Comedies.
This is the log information of setting <All's Well That Ends Well> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: As You Like Itof genre: Comedies.
This is the log information of setting <As You Like It> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15

Setting the book: The Comedy of Errorsof genre: Comedies.
This is the log information of setting <The Comedy of Errors> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6 node with key 9

Setting the book: Love's Labor's Lostof genre: Comedies.
This is the log information of setting <Love's Labor's Lost> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: Measure for Measureof genre: Comedies.
This is the log information of setting <Measure for Measure> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27

Setting the book: The Merchant of Veniceof genre: Comedies.
This is the log information of setting <The Merchant of Venice> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: The Merry Wives of Windsorof genre: Comedies.
This is the log information of setting <The Merry Wives of Windsor> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27

Setting the book: A Midsummer Night's Dreamof genre: Comedies.
This is the log information of setting <A Midsummer Night's Dream> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: Much Ado About Nothingof genre: Comedies.
This is the log information of setting <Much Ado About Nothing> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15

Setting the book: The Taming of the Shrewof genre: Comedies.
This is the log information of setting <The Taming of the Shrew> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19

Setting the book: Twelfth Nightof genre: Comedies.
This is the log information of setting <Twelfth Night> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27

Setting the book: The Two Gentlemen of Veronaof genre: Comedies.
This is the log information of setting <The Two Gentlemen of Verona> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6 node with key 9

Setting the book: The Two Noble Kinsmenof genre: Comedies.
This is the log information of setting <The Two Noble Kinsmen> of genre Comedies to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27

Setting the book: Henry IV, Part 1of genre: Histories.
This is the log information of setting <Henry IV, Part 1> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6 node with key 9

Setting the book: Henry IV, Part 2of genre: Histories.
This is the log information of setting <Henry IV, Part 2> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27

Setting the book: Henry Vof genre: Histories.
This is the log information of setting <Henry V> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: Henry VI, Part 1of genre: Histories.
This is the log information of setting <Henry VI, Part 1> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: Henry VI, Part 2of genre: Histories.
This is the log information of setting <Henry VI, Part 2> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27

Setting the book: Henry VI, Part 3of genre: Histories.
This is the log information of setting <Henry VI, Part 3> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: Henry VIIIof genre: Histories.
This is the log information of setting <Henry VIII> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6

Setting the book: King Johnof genre: Histories.
This is the log information of setting <King John> of genre Histories to the DHT is:
This set operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key 6
```

- Postive test case: set operation & input mode. It display the message to guide the user enter the book and genre. (No genre miss case for input mode)

- Negative test case: set operation & file mode & genre is missing. It display the book name and set the genre to 'missing'.

- Negative test case: set operation & file mode & inexistent file. It displays exception and asks the user to enter again.

- Positive test case: get operation. It guides the user to enter the book name and display the genre retrieved and log file(visited nodes).

- Negative test case: get operation & inexistent book name. It displays sorry, not found the genre of book and the log file(visited nodes).

```
In get mode.
Please enter the book's name:
Foundation
The genre of the book <Foundation> is: Sorry, not found the genre of the book <Foundation>..
This is the log information of getting <Foundation>'s genre out of the DHT is:
This get operation has visited these nodes: node with key 15 node with key 19 node with key 27 node with key
 6 node with key 9

Please enter exit to quit the program, enter other things to continue operating.
```

- Negative test case: get operation & inexistent book name. It displays sorry, not found the genre of book and the log file(visited nodes).