

GTU DEPARTMENT of COMPUTER ENGINEERING
CSE222/505 – SPRING 2023
HOMEWORK 3 REPORT

ÖMER FARUK ÇOLAKEL
200104004043

1. SYSTEM REQUIREMENTS

```
public Account(int accountID, String userName, String birthDate, String location)
```

An account requires a unique id, a username, a birthdate and a location.

```
public Message(int messageID, String content, int senderID, int receiverID)
```

A message requires an ID which is given by the account sending and receiving it, a content, senderID and receiverID which was given by sender account. Sender and receiver hold the messages in separate arrays and same message have different IDs.

```
public Post(int postID, String content, int accountID)
```

A post requires a postID (which was given by the account posting it using number of posts in the account), content (which was given by the user) and accountID that is posting it.

```
public Interaction(int interactionID, int accountID, int postID)
```

Interaction class is an abstract class but it is a base class for Like and Comment classes. It is being called with super(interactionID, accountID, postID) by them. It requires an ID (which was given by the account automatically), accountID and postID is the of the post that the interaction was made on.

```
public Like(int interactionID, int accountID, int postID)
```

This constructor calls super class's constructor which is Interaction.

```
public Comment(int interactionID, int accountID, int postID, String content)
```

This constructor calls super class's constructor which is Interaction. Then sets the content by itself, since Interaction has no content.

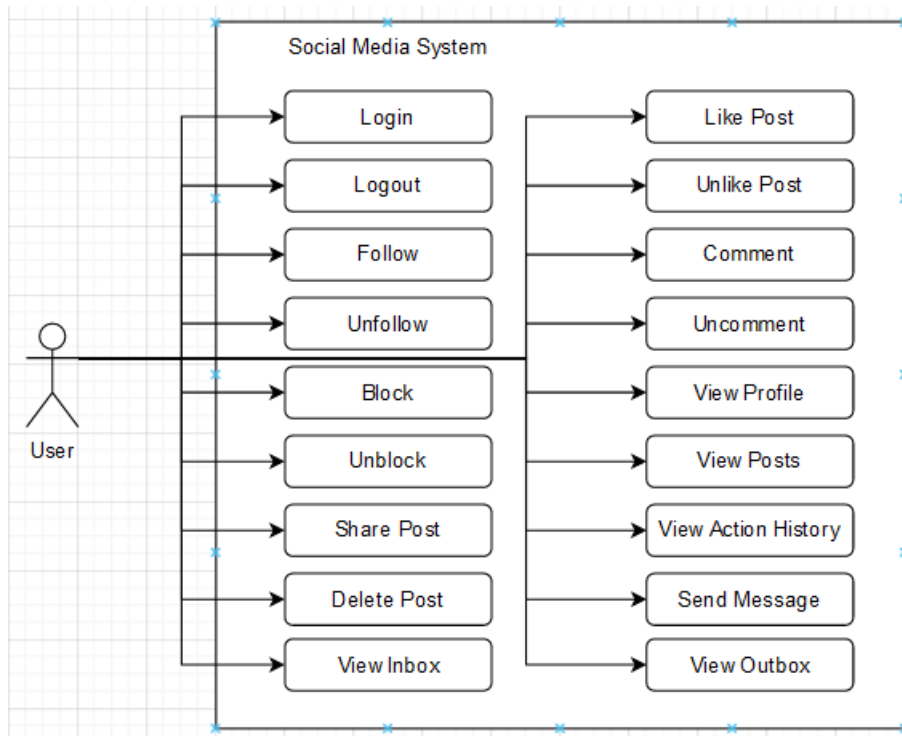
```
public LDLinkedList() {
```

LDLinkedList doesn't require any parameters to be instantiated.

```
public LDListIterator()
```

Iterator for LDLinkedList doesn't require any parameters to be instantiated.

2. USE CASE DIAGRAM



3. PROBLEM SOLUTION APPROACH

The difference between LinkedList and LDLinkedList is custom lazy deletion. I first, extended AbstractList class and implemented List interface for LDLinkedList. Because of this I had to override some methods.

I created a nested class for Node which holds "data" that has the type of "E" and references both for previous and next Node.

"deletedFlag" is a boolean and it's equal to true if user deleted an element. "deletedNode" holds the reference for that node. LDLinkedList and it's iterator works around these variables.

"toString" method to return all nodes' data. List hold the data of head(reference to first element), deletedNode(reference to previously deleted node) and size(size of the list).

"getNode" method takes an index, checks if the index is valid, finds the node with that index and returns the reference to it.

First "add" method adds an element to the end of the list.

Second "add" method add an element with the given index. Problem with this method is that, we should check if there is a deleted node before or after that index. If there is, we should avoid referencing to it while adding the new node.

First "remove" method removes a node in given index. If there are no nodes that was deleted or program deleted two nodes, we should assign true to deletedFlag boolean and assign the reference of that node to deletedNode. If program deleted a node before, we should delete both nodes from the list.

Second "remove" method finds the index of the node with the given data and calls first "remove" method with that index.

Iterators are efficient ways of going through a list. So, I had to implement one. My iterator holds the data of previously returned node, next node and index of next node. Since I implemented the ListIterator interface I had to override some methods.

“hasNext” method checks if there is a next method. It checks if the next method is deleted or not. If it is, then it checks if there is a node after the deleted node.

“next” method iterates to next node if there is a next node. Returns the data of the next node.

“hasPrevious” method works like hasNext but checks previous nodes.

“previous” method works like next method but iterates to previous node. Returns the data of previous node.

“remove” method works like the previous remove method that I have mentioned.

4-5. TEST CASES and RESULTS

You can run test cases according to the commands in readme.txt.

Login

```
sibelgulmez.login( userName: "sibelgulme");
sibelgulmez.login( userName: "sibelgulmez");
sibelgulmez.login( userName: "sibelgulmez");
```

Login Result

```
Login failed!
Logging into an account (username:sibelgulmez)...
You are already logged in!
```

Sharing Post

```
gokhankaya.sharePost(new Post( postID: 0, content: "Hello!", gokhankaya.getAccountID()));
sibelgulmez.sharePost(new Post( postID: 0, content: "Hello!", sibelgulmez.getAccountID()));
sibelgulmez.sharePost(new Post( postID: 0, content: "Hello!", sibelgulmez.getAccountID()));
sibelgulmez.sharePost(new Post( postID: 1, content: "Sibel Gülmez", sibelgulmez.getAccountID()));
```

Sharing Post Result

```
You need to login first!
Post shared successfully!
You have already shared this post!
Post shared successfully!
```

Following

```
sibelgulmez.follow(gizemsungu);
gokhankaya.follow(sibelgulmez);
sibelgulmez.follow(gizemsungu);
sibelgulmez.follow(gokhankaya);
```

Following Result

```
You are now following gizemsungu
You need to login first!
You are already following this account!
You are now following gokhankaya
```

Logout

```
sibelgulmez.logout();
gokhankaya.logout();
```

Logout Result

```
Logging out from account 'sibelgulmez'...
You are already logged out!
```

Viewing Profile and Posts

```
gokhankaya.viewPosts(sibelgulmez);
gokhankaya.viewProfile(sibelgulmez);
gokhankaya.viewPosts(sibelgulmez);
```

Viewing Profile and Posts Result

```
You need to view the profile first!
User ID: 2
Username: sibelgulmez
Location: USA
Birth Date: 01/01/2000
sibelgulmez is following 2 account(s) and has 0 follower(s).
sibelgulmez is following:
gizemsungu,
gokhankaya,
sibelgulmez has 2 posts.
Posts of sibelgulmez:
Post 1:
Post ID: 0
Hello!
Likes: 0
Comments: 0

Post 2:
Post ID: 1
Sibel Gülmez
Likes: 0
Comments: 0
```

Liking a Post

```
gokhankaya.likePost(sibelgulmez, postID: 0);
gokhankaya.likePost(sibelgulmez, postID: 0);
```

Liking a Post Result

```
You liked the post!
You already liked this post!
```

Commenting

```
gokhankaya.comment(sibelgulmez, postID: 0, content: "Hello Sibel!");
```

Commenting Result

```
You already liked this post.
You commented on the post!
```

Sending Message

```
gokhankaya.sendMessage(gizemsungu, content: "Hi Gizem!");
```

Sending Message Result

```
Message sent!
```

Viewing Outbox/Inbox

```
gokhankaya.viewOutbox();
gokhankaya.viewInbox();
```

Viewing Outbox/Inbox Result

```
Message sent!
Message 1:
Message ID: 0
Content: Hi Gizem!
Receiver: 0

You have no messages in inbox!
```

Blocking an Account

```
gizemsungu.login( userName: "gizemsungu");
gizemsungu.blockAccount(sibelgulmez);
gizemsungu.logout();

sibelgulmez.login( userName: "sibelgulmez");
sibelgulmez.follow(gizemsungu);
sibelgulmez.viewProfile(gizemsungu);
sibelgulmez.sendMessage(gizemsungu, content: "Hello!");
sibelgulmez.logout();
```

Blocking an Account Result

```
Logging out from account 'gizemsungu'...
Logging into an account (username:gizemsungu)...
Account blocked!
Logging out from account 'gizemsungu'...
Logging into an account (username:sibelgulmez)...
You are blocked by this account!
You are blocked by this account!
You are blocked by this account!
Logging out from account 'sibelgulmez'...
```

Viewing Comments

```
gizemsungu.viewProfile(sibelgulmez);
gizemsungu.viewPosts(sibelgulmez);
gizemsungu.viewComments(sibelgulmez, postId: 0);
```

Viewing Comments Result

```
User ID: 2
Username: sibelgulmez
Location: USA
Birth Date: 01/01/2000
sibelgulmez is following 2 account(s) and has 1 follower(s).
sibelgulmez is following:
gizemsungu,
gokhankaya,
sibelgulmez has 2 posts.
Posts of sibelgulmez:
Post 1:
Post ID: 0
Hello!
Likes: 1
Comments: 1

Post 2:
Post ID: 1
Sibel Gülmez
Likes: 0
Comments: 0

Comments:
Hello Sibel!
```

Unlike Post

```
gokhankaya.unlikePost(gizemsungu, postId: 0);
```

Unlike Post Result

```
You have unliked a post!
```

Delete Comment

```
gokhankaya.uncomment(sibelgulmez, postID: 0);
```

Delete Comment Result

```
You have deleted a comment!
```

Unblock

```
gizemsungu.unblock(sibelgulmez);
```

Unblock Result

```
You have unblocked sibelgulmez!
```

View Action History

View Action History Result

Output of Scenario 1:

You have successfully logged in!

You have shared a post!

You have shared a post!

You are now following gizemsungu!

You are now following gokhankaya!

You have successfully logged out!

You have successfully logged in!

You should view this account first!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 0

Number of Following: 2

gizemsungu

gokhankaya

Post ID: 0

Content: Hello!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 0

Number of Followers: 1

sibelgulmez

Number of Following: 0

You have liked a post!

You have already liked this post!

You have commented a post!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 0

Number of Following: 2

gizemsungu

gokhankaya

Post ID: 0

Content: Hello!

Number of Likes: 1

Number of Comments: 1

Comment count: 1

Comments:

1: Hello Sibel!

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You are now following sibelgulmez!

You are now following gizemsungu!

You have sent a message to gizemsungu!

You have sent 1 messages!

Message ID: 0

Receiver: 0

Content: Hi Gizem!

You have successfully logged out!

You have successfully logged in!

Output of Scenario 2:

You have successfully logged in!

You have shared a post!

You have shared a post!

You have successfully logged out!

You have successfully logged in!

Number of messages in outbox: 0

Number of messages in inbox: 1

Message ID: 0

Sender: 1

Content: Hi Gizem!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 2

gizemsungu

gokhankaya

Post ID: 0

Content: Hello!

Number of Likes: 1

Number of Comments: 1

Comment count: 1

Comments:

1: Hello Sibel!

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have successfully logged out!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 2

sibelgulmez

gokhankaya

Number of Following: 0

Post ID: 0

Content: Hello1!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have liked a post!

You have successfully logged out!

You have successfully logged in!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 2

sibelgulmez

gokhankaya

Number of Following: 0

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have commented a post!

You have sent a message to gizemsungu!

You have successfully logged out!

You have successfully logged in!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 2

sibelgulmez

gokhankaya

Number of Following: 0

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 1

Comment count: 1

Comments:

1: Nice!

Message ID: 0

Sender: 1

Content: Hi Gizem!

Message ID: 1

Sender: 1

Content: Hello!

You have successfully logged out!

Output of Scenario 3:

You have successfully logged in!
You have blocked sibelgulmez!
You have successfully logged out!
You have successfully logged in!
This account has blocked you!
This account has blocked you!
This account has blocked you!
You have successfully logged out!

Output of Scenario 4:

You have successfully logged in!
You have shared a post!
You have shared a post!
You are now following gizemsungu!
You are now following gokhankaya!
You have successfully logged out!
You have successfully logged in!
You should view this account first!
Account ID: 2
Username: sibelgulmez
Birth Date: 01/01/2000
Location: USA
Number of Posts: 2
Number of Followers: 0
Number of Following: 2
gizemsungu
gokhankaya
Post ID: 0
Content: Hello!
Number of Likes: 0
Number of Comments: 0
No one commented it yet.
Post ID: 1
Content: Sibel Gülmez
Number of Likes: 0

Number of Comments: 0
No one commented it yet.
Account ID: 0
Username: gizemsungu
Birth Date: 01/01/2000
Location: Turkey
Number of Posts: 0
Number of Followers: 1
sibelgulmez
Number of Following: 0
You have liked a post!
You have already liked this post!
You have commented a post!
Account ID: 2
Username: sibelgulmez
Birth Date: 01/01/2000
Location: USA
Number of Posts: 2
Number of Followers: 0
Number of Following: 2
gizemsungu
gokhankaya
Post ID: 0
Content: Hello!
Number of Likes: 1

Number of Comments: 1

Comment count: 1

Comments:

1: Hello Sibel!

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You are now following sibelgulmez!

You are now following gizemsungu!

You have sent a message to gizemsungu!

You have sent 1 messages!

Message ID: 0

Receiver: 0

Content: Hi Gizem!

You have successfully logged out!

You have successfully logged in!

Number of messages in outbox: 0

Number of messages in inbox: 1

Message ID: 0

Sender: 1

Content: Hi Gizem!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 2

gizemsungu

gokhankaya

Post ID: 0

Content: Hello!

Number of Likes: 1

Number of Comments: 1

Comment count: 1

Comments:

1: Hello Sibel!

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have successfully logged out!

You have successfully logged in!

You have shared a post!

You have shared a post!

You have successfully logged out!

You have successfully logged in!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 2

sibelgulmez

gokhankaya

Number of Following: 0

Post ID: 0

Content: Hello1!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have liked a post!

You have successfully logged out!

You have successfully logged in!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 2

sibelgulmez

gokhankaya

Number of Following: 0

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have commented a post!

You have sent a message to gizemsungu!

You have successfully logged out!

You have successfully logged in!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 2

sibelgulmez

gokhankaya

Number of Following: 0

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 1

Comment count: 1

Comments:

1: Nice!

Message ID: 0

Sender: 1

Content: Hi Gizem!

Message ID: 1

Sender: 1

Content: Hello!

You have successfully logged out!

You have successfully logged in!

You have blocked sibelgulmez!

You have successfully logged out!

You have successfully logged in!

This account has blocked you!

This account has blocked you!

This account has blocked you!

You have successfully logged out!

SCENARIO 4

You have successfully logged in!

You are now following account4!

You are now following account5!

You are now following account6!

You are now following account7!

You are now following account8!

You are now following account9!

You are now following account10!

You have successfully logged out!

UNLIKE:

You have successfully logged in!

Before Like:

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 7

account4

account5

account6

account7

account8

account9

account10

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 1

Comment count: 1

Comments:

1: Nice!

You have liked a post!

After Like:

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 7

account4

account5

account6

account7

account8

account9

account10

Post ID: 0

Content: Hello1!

Number of Likes: 2

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 1

Comment count: 1

Comments:

1: Nice!

You have unliked a post!

After Unlike:

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 7

account4

account5

account6

account7

account8

account9

account10

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 1

Comment count: 1

Comments:

1: Nice!

You have successfully logged out!

UNBLOCK:

You have successfully logged in!

You have unblocked sibelgulmez!

You have successfully logged out!

You have successfully logged in!

Account ID: 0

Username: gizemsungu

Birth Date: 01/01/2000

Location: Turkey

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 7

account4

account5

account6

account7

account8

account9

account10

Post ID: 0

Content: Hello1!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Hello2!

Number of Likes: 0

Number of Comments: 1

Comment count: 1

Comments:

1: Nice!

You are now following gizemsungu!

You have sent a message to gizemsungu!

You have successfully logged out!

You have successfully logged in!

Message ID: 0

Sender: 1

Content: Hi Gizem!

Message ID: 1

Sender: 1

Content: Hello!

Message ID: 0

Sender: 2

Content: Hello!

You have successfully logged out!

UNCOMMENT:

You have successfully logged in!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 2

gokhankaya

gizemsungu

Post ID: 0

Content: Hello!

Number of Likes: 1

Number of Comments: 1

Comment count: 1

Comments:

1: Hello Sibel!

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

You have deleted a comment!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 2

gokhankaya

gizemsungu

Post ID: 0

Content: Hello!

Number of Likes: 1

Number of Comments: 0

No one commented it yet.

Post ID: 1

Content: Sibel Gülmez

Number of Likes: 0

Number of Comments: 0

No one commented it yet.

UNFOLLOW:

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 1

gokhankaya

Number of Following: 2

gokhankaya

gizemsungu

Account ID: 1

Username: gokhankaya

Birth Date: 01/01/2000

Location: UK

Number of Posts: 0

Number of Followers: 1

sibelgulmez

Number of Following: 2

sibelgulmez

gizemsungu

You are no longer following sibelgulmez!

Account ID: 1

Username: gokhankaya

Birth Date: 01/01/2000

Location: UK

Number of Posts: 0

Number of Followers: 1

sibelgulmez

Number of Following: 1

gizemsungu

You have successfully logged out!

You have successfully logged in!

Account ID: 2

Username: sibelgulmez

Birth Date: 01/01/2000

Location: USA

Number of Posts: 2

Number of Followers: 0

Number of Following: 2

gokhankaya

gizemsungu

You have successfully logged out!

Action History:

You have successfully logged in!

sibelgulmez is now following you!

You have liked a post!

You have commented a post!

You are now following sibelgulmez !

You are now following gizemsungu !

You have sent a message to gizemsungu!

You have commented a post!

You have sent a message to gizemsungu!

You have liked a post!

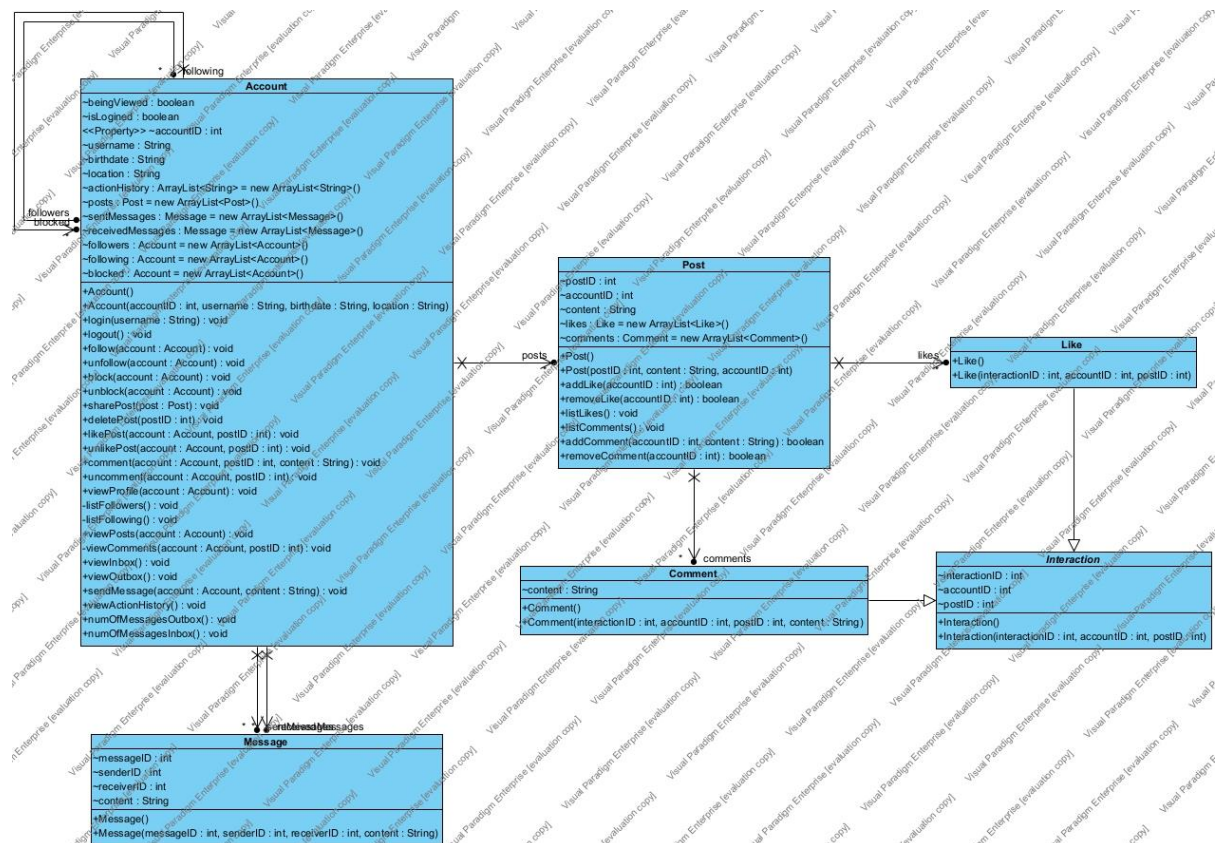
You have unliked a post!

You have deleted a comment!

You are no longer following sibelgulmez !

You have successfully logged out!

Class Diagram for Part 1 and Part 2



Time Complexity

Sharing Post

Array	ArrayList	LinkedList	LDLinkedList
3ms	0ms	1ms	2ms

Follow

Array	ArrayList	LinkedList	LDLinkedList
0ms	6ms	5ms	6ms

Unfollow

Array	ArrayList	LinkedList	LDLinkedList
-	0ms	0ms	0ms

Block

Array	ArrayList	LinkedList	LDLinkedList
0ms	1ms	0ms	0ms

Unblock

Array	ArrayList	LinkedList	LDLinkedList
-	1ms	0ms	0ms

Like Post

Array	ArrayList	LinkedList	LDLinkedList
0ms	1ms	1ms	2ms

Unlike Post

Array	ArrayList	LinkedList	LDLinkedList
-	0ms	0ms	0ms

Comment

Array	ArrayList	LinkedList	LDLinkedList
0ms	0ms	0ms	0ms

Uncomment

Array	ArrayList	LinkedList	LDLinkedList
-	0ms	0ms	0ms

Send Message

Array	ArrayList	LinkedList	LDLinkedList
0ms	1ms	1ms	1ms

All of these methods' worst-case scenario is $O(n)$ regardless of data structures that we use. We don't have to do anything special for array but for others we should use iterators. Without iterators, big oh notations would be $O(n^2)$ since we are going through the list from the start to get an element. Iterators mark the last returned element so we don't have to go through the list constantly. I used them in arraylist, linkedlist and dlinkedlist.