



# Programming Fundamentals

Inheritance: Improving Structure

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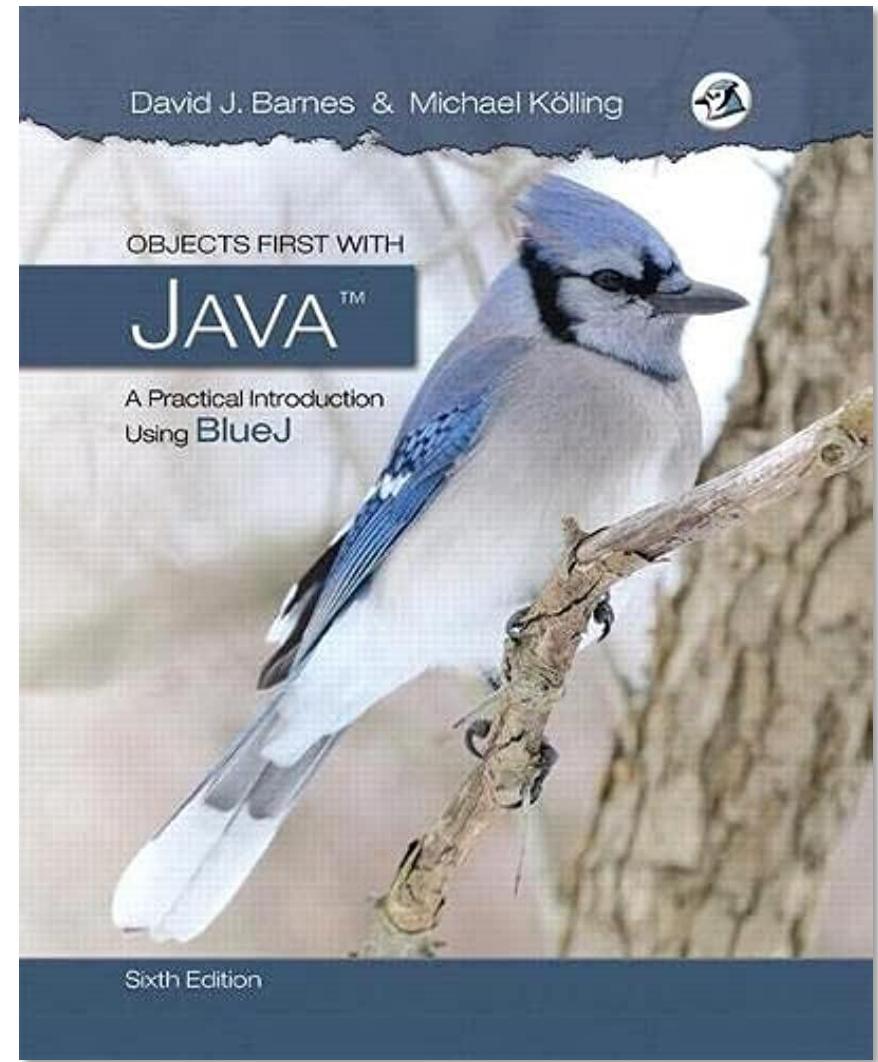
# Agenda

- Social Network v1



# Lectures & Labs

- This weeks lectures and labs are based on examples in:
- **Objects First with Java**
  - A Practical Introduction using BlueJ, © *David J. Barnes, Michael Kölling*

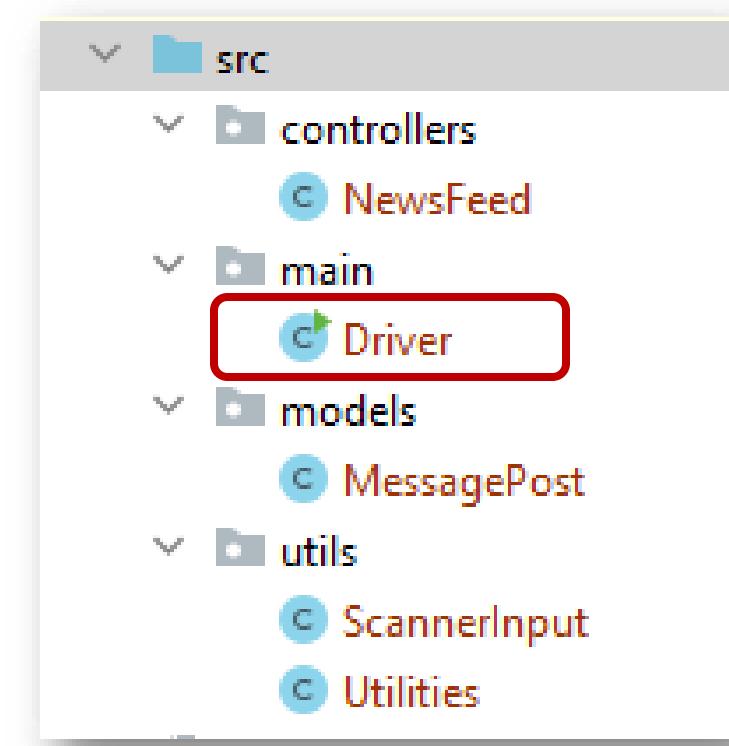


# Social Network V3.0 – Recap

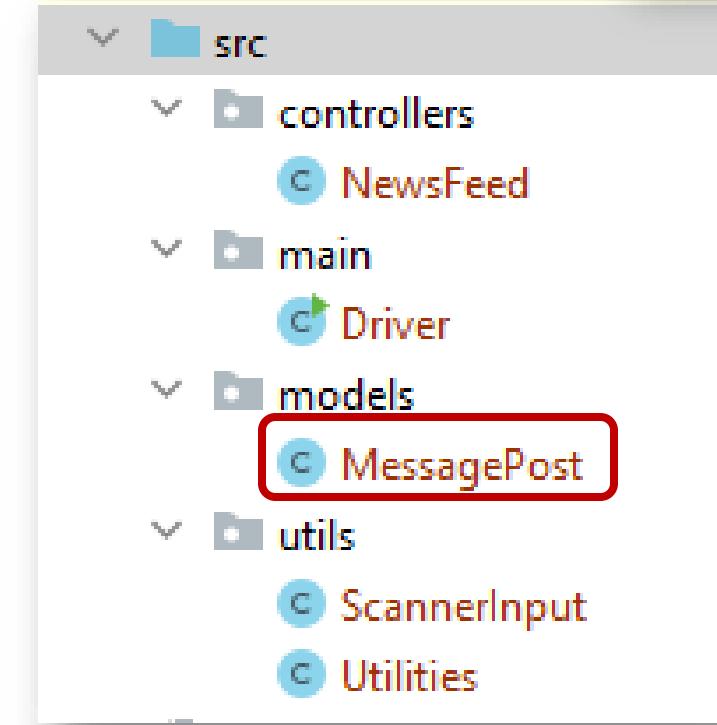
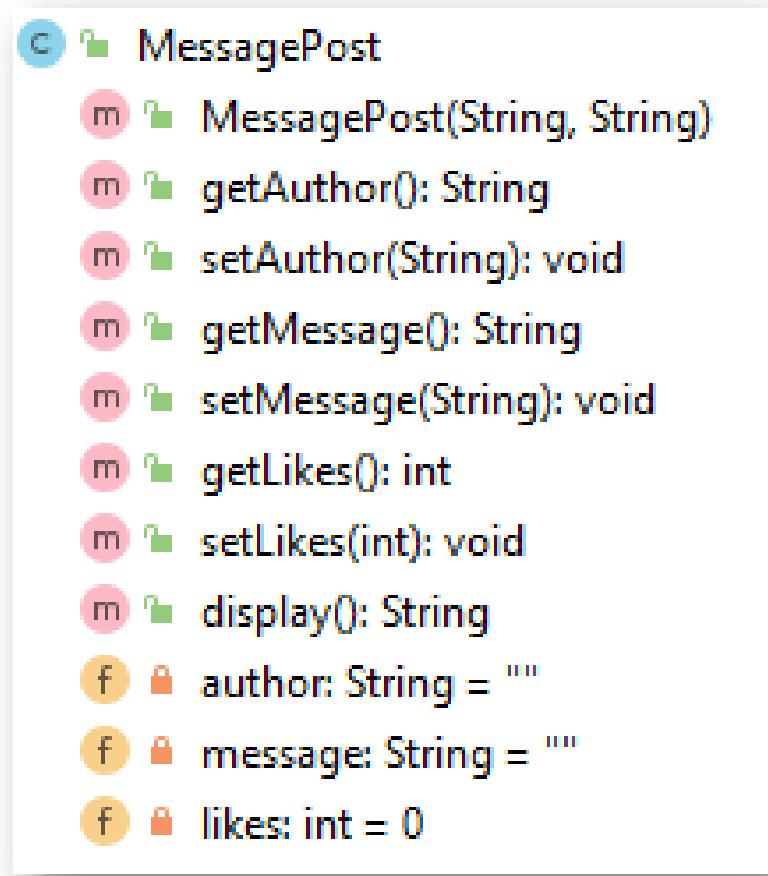
- A small, prototype SOCIAL NETWORK.
- Supports a **News Feed** with posts.
- POSTS:
  - **MessagePost:**
    - multi-line text message.
  - Operations
    - e.g., add, display and remove.



# Social Network V3.0 – Recap



# Social Network V3.0 – Recap



Social Network Menu

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- 1) Add a Message Post
- 2) List all Posts
- 3) Update a Message Post
- 4) Delete a Message Post

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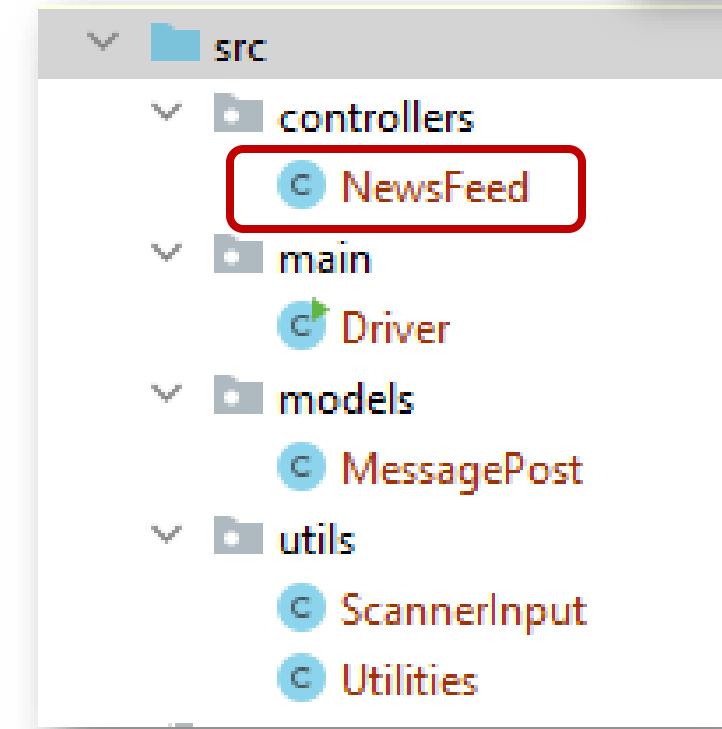
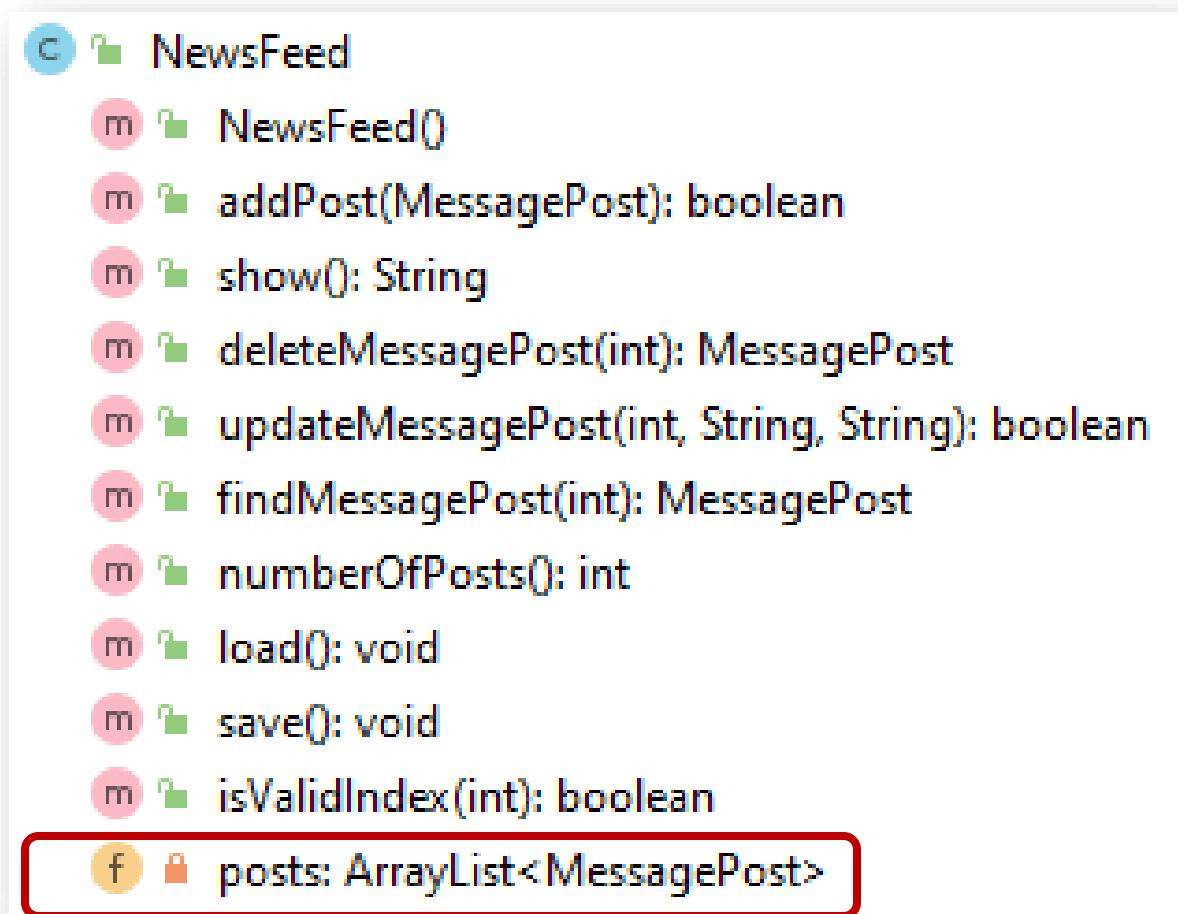
- 5) Save Posts
- 6) Load Posts

---

- 0) Exit

=>>

# Social Network V3.0 – Recap



Social Network Menu

---

- 1) Add a Message Post
- 2) List all Posts
- 3) Update a Message Post
- 4) Delete a Message Post

---

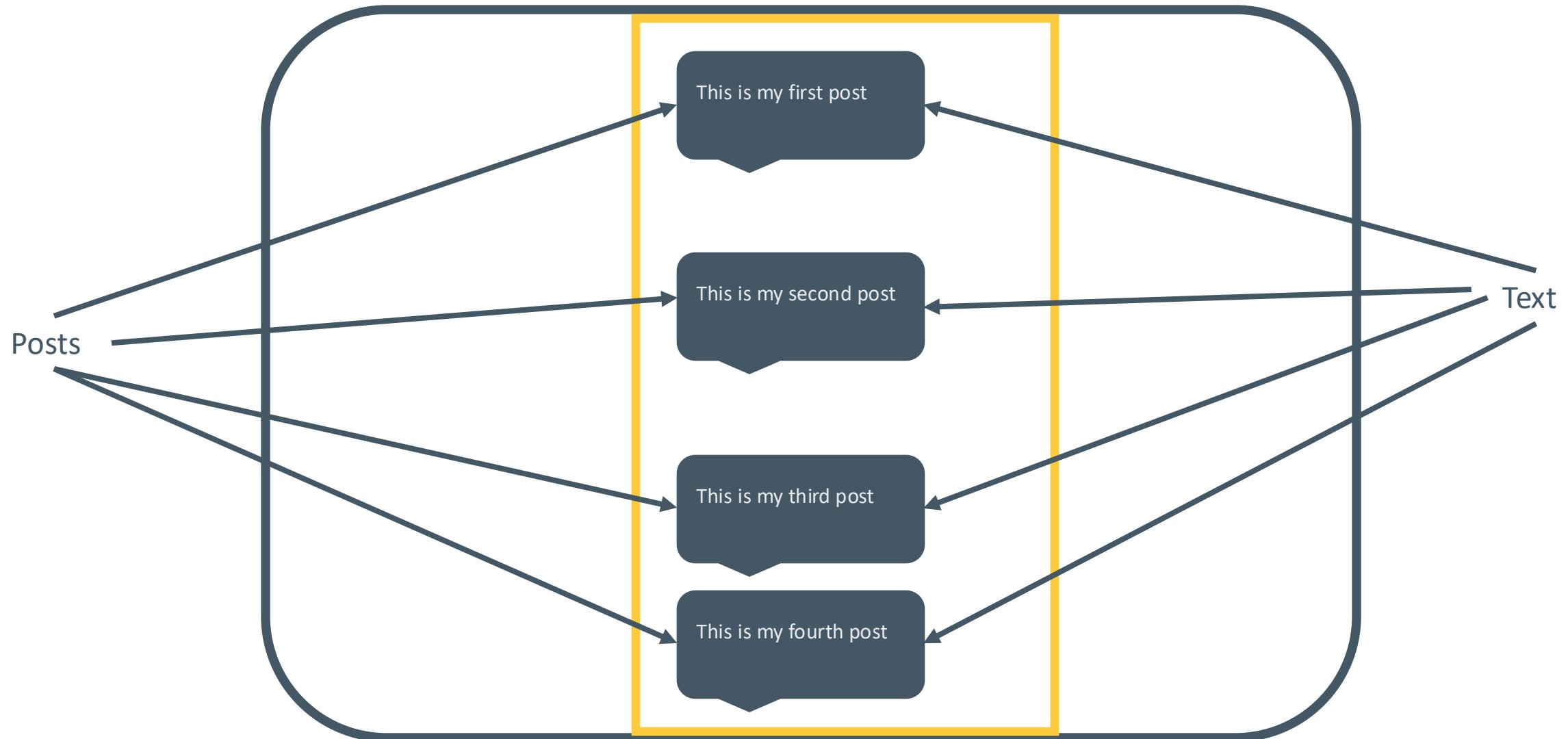
- 5) Save Posts
- 6) Load Posts

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- 0) Exit

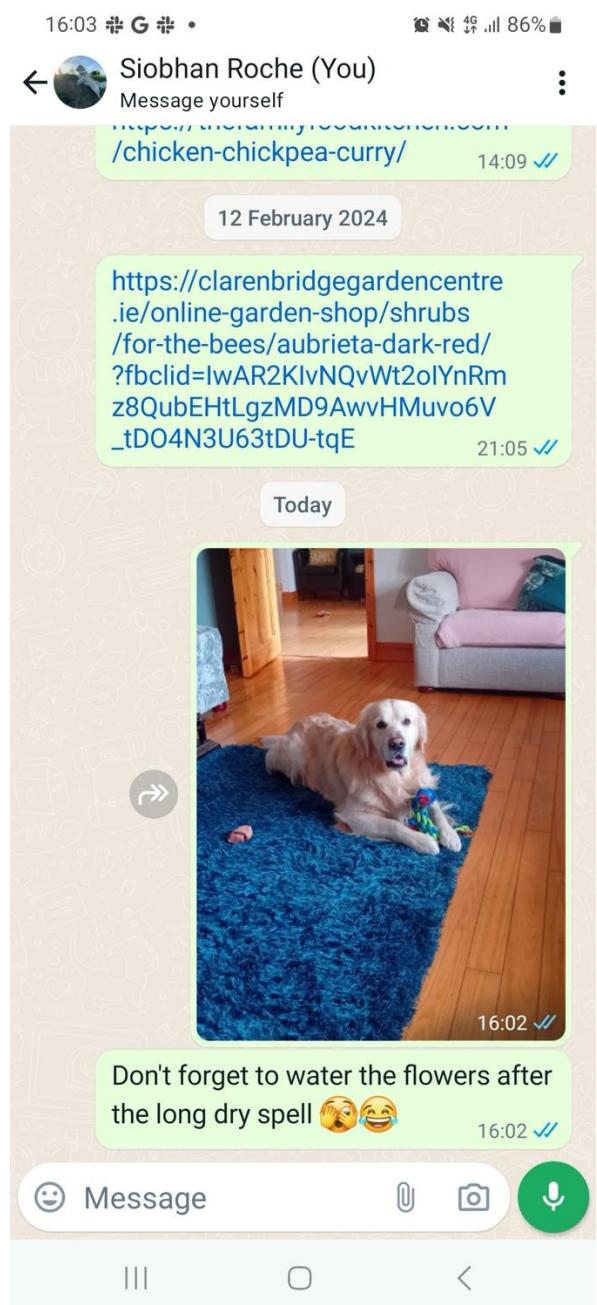
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# Social Network

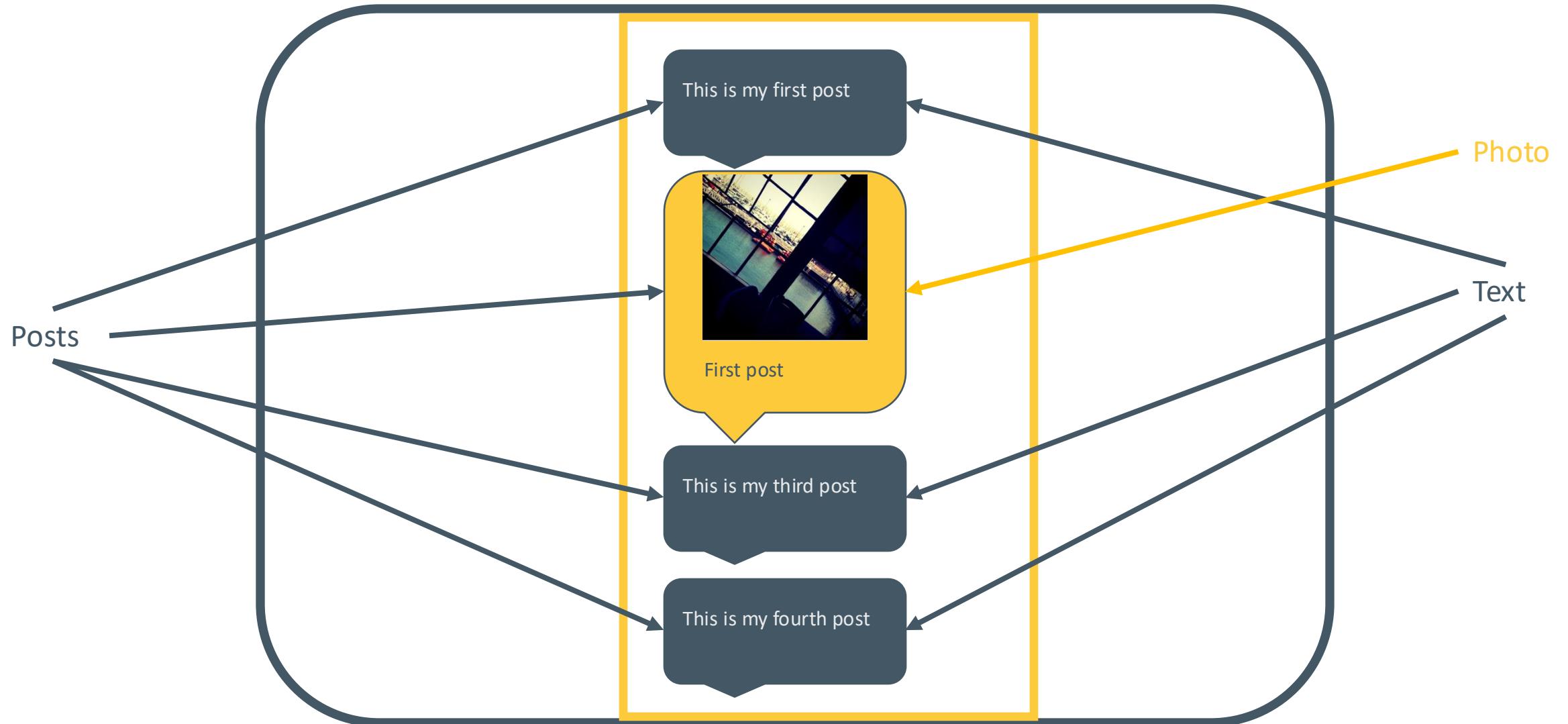


# Social Network v4.0 – lets move it on!

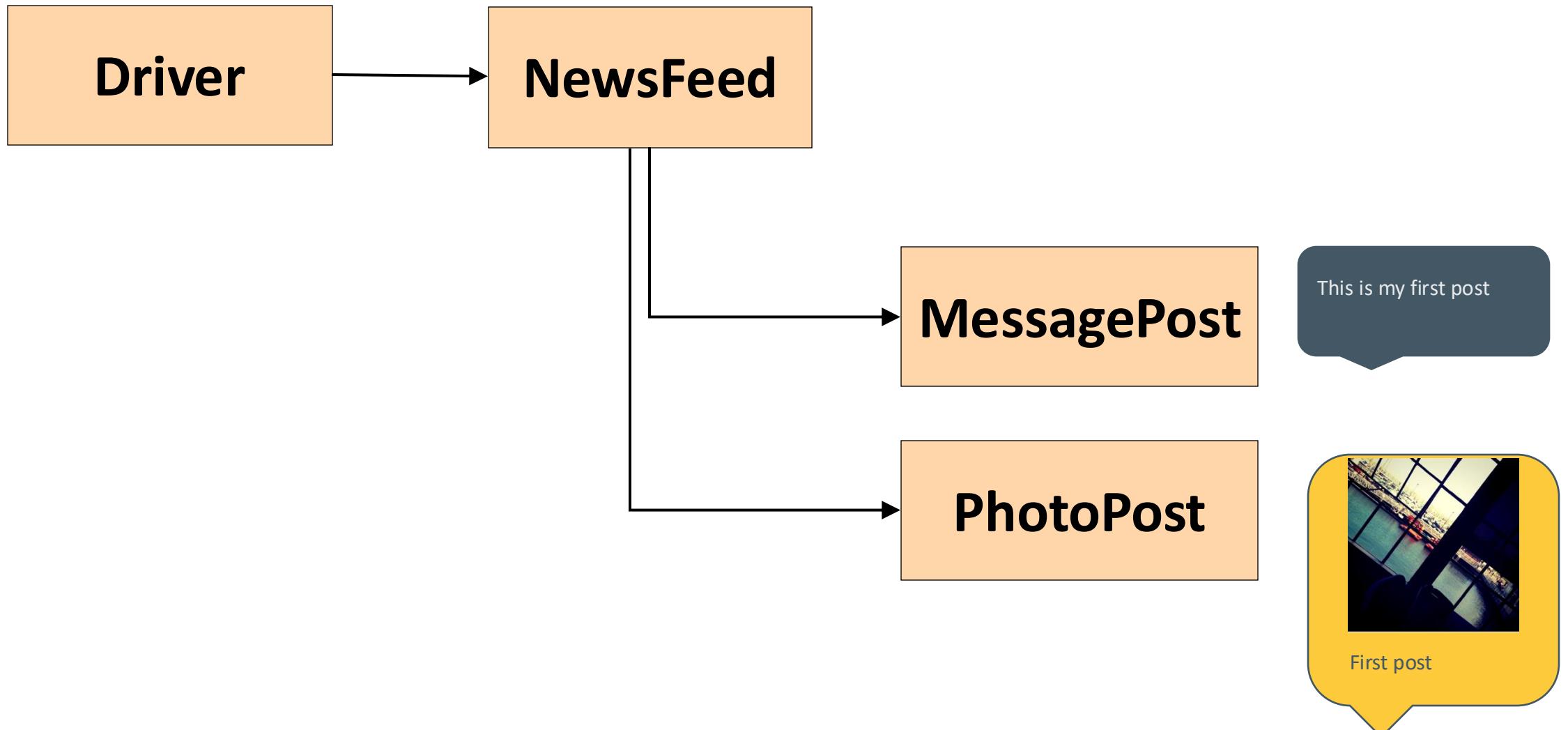
- A small, prototype SOCIAL NETWORK.
- Supports a News Feed with posts.
- **POSTS:**
  - **MessagePost:**
    - multi-line text messages.
  - **PhotoPost:**
    - photo and caption.
- **Operations**
  - e.g., search, display and remove.



# Social Network



# Social Network V4.0 – Class Diagram

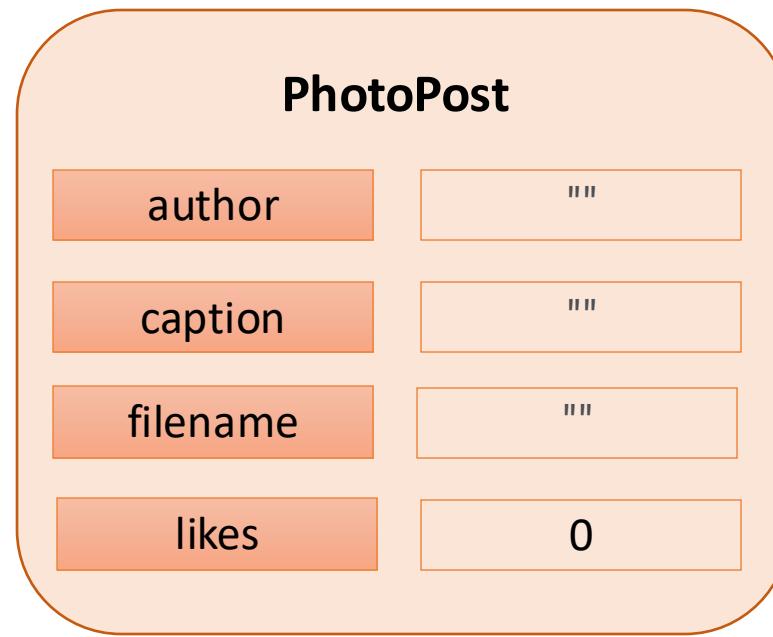


# Social Network V4.0 – Two Object Types



This is my first post

**MessagePost:**  
multi-line text  
message.



First post

**PhotoPost:**  
photo and caption.

# Social Network V4.0 – Class Structure

c ↗ **MessagePost**

- m ↗ **MessagePost(String, String)**
- m ↗ **getAuthor(): String**
- m ↗ **setAuthor(String): void**
- m ↗ **getMessage(): String**
- m ↗ **setMessage(String): void**
- m ↗ **getLikes(): int**
- m ↗ **setLikes(int): void**
- m ↗ **display(): String**

f 🔒 **author: String = ""**

f 🔒 **message: String = ""**

f 🔒 **likes: int = 0**

**MessagePost**

author	""
message	""
likes	0

c ↗ **PhotoPost**

- m ↗ **PhotoPost(String, String, String)**
- m ↗ **getAuthor(): String**
- m ↗ **setAuthor(String): void**
- m ↗ **getCaption(): String**
- m ↗ **setCaption(String): void**
- m ↗ **setFilename(String): void**
- m ↗ **getFilename(): String**
- m ↗ **getLikes(): int**
- m ↗ **setLikes(int): void**
- m ↗ **display(): String**

f 🔒 **author: String = ""**

f 🔒 **caption: String = ""**

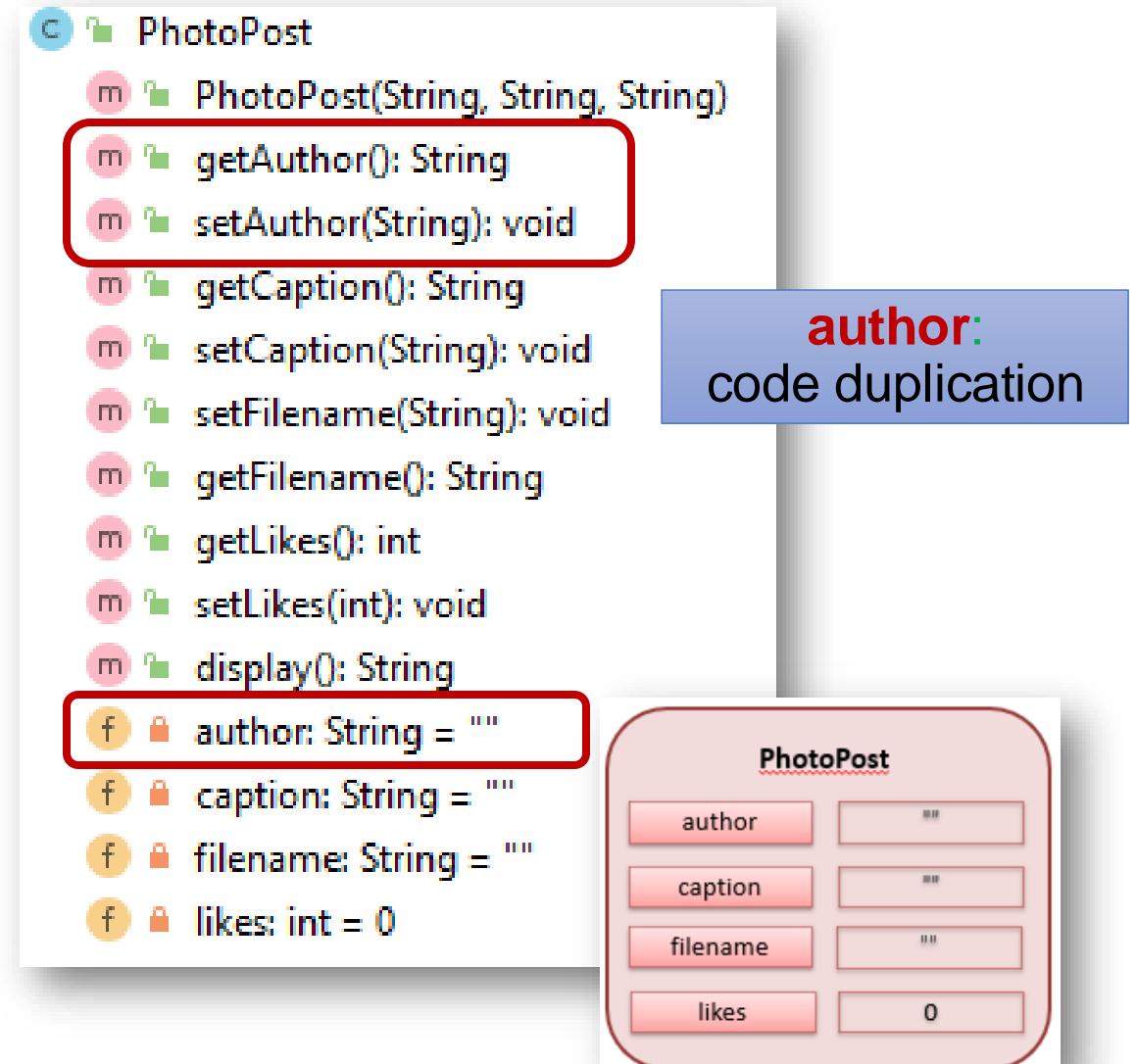
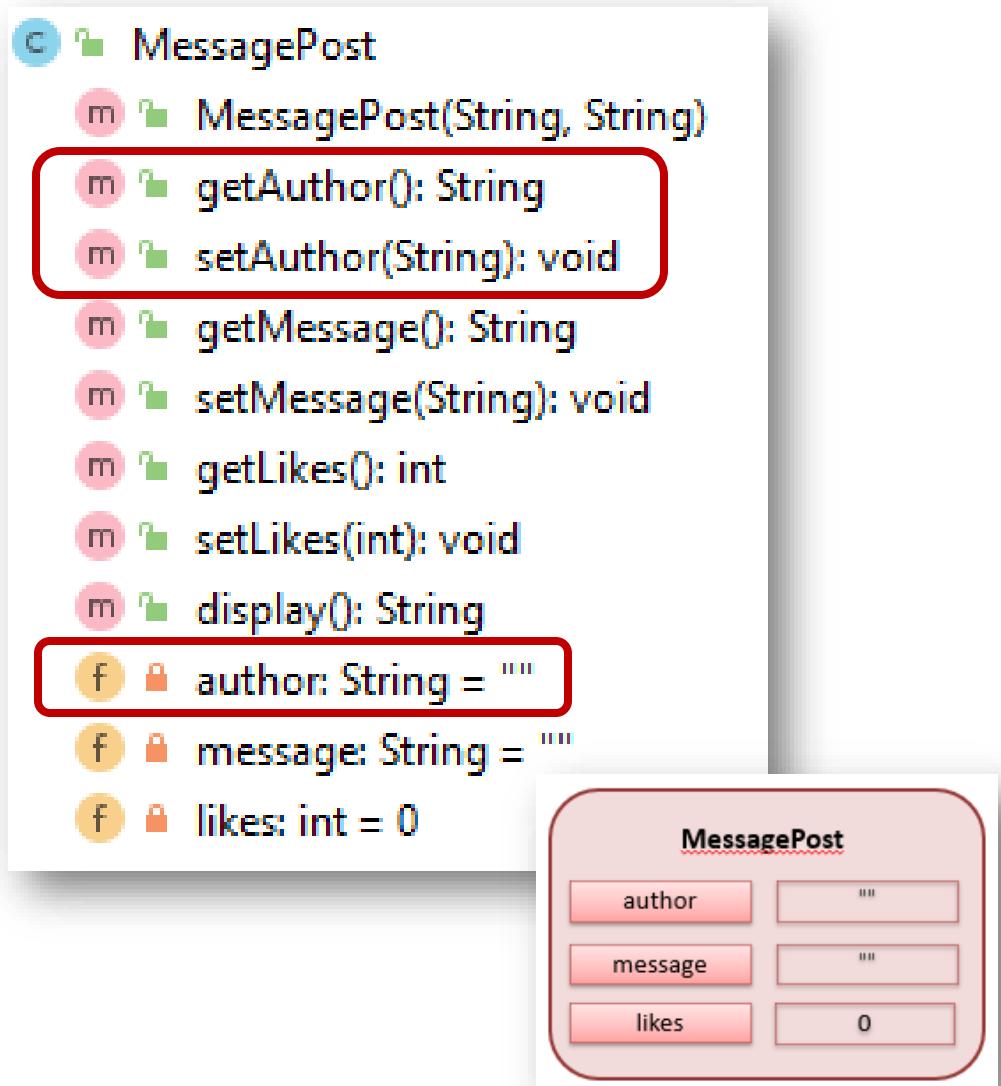
f 🔒 **filename: String = ""**

f 🔒 **likes: int = 0**

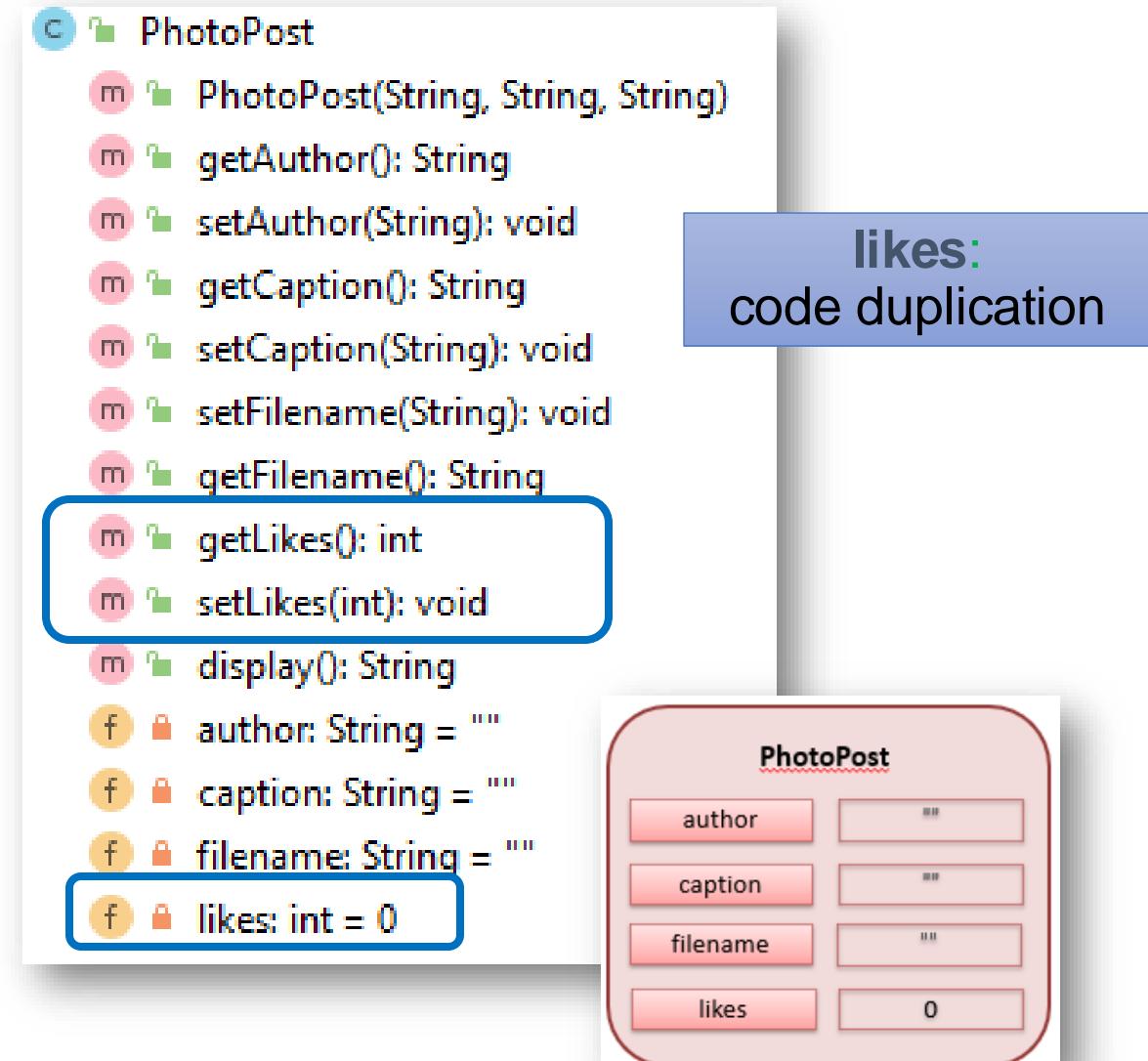
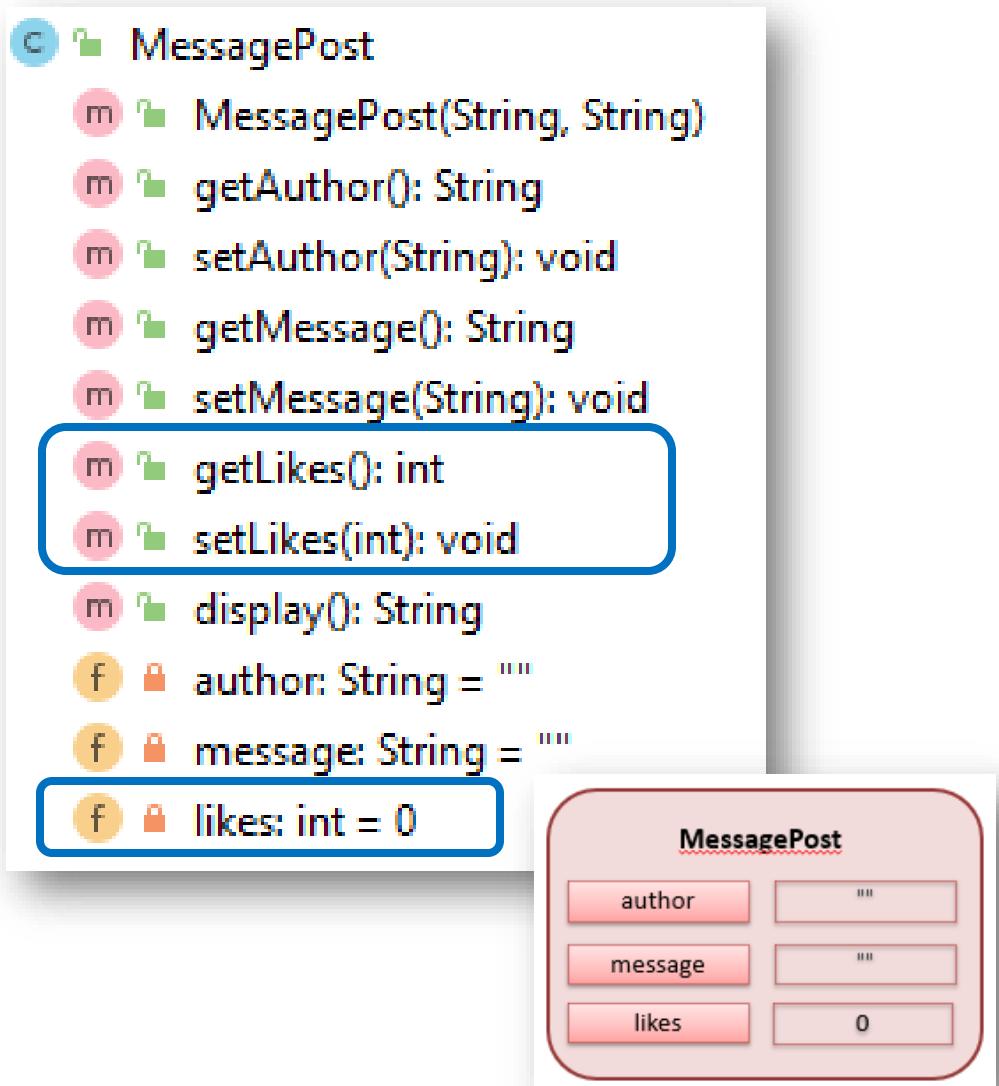
**PhotoPost**

author	""
caption	""
filename	""
likes	0

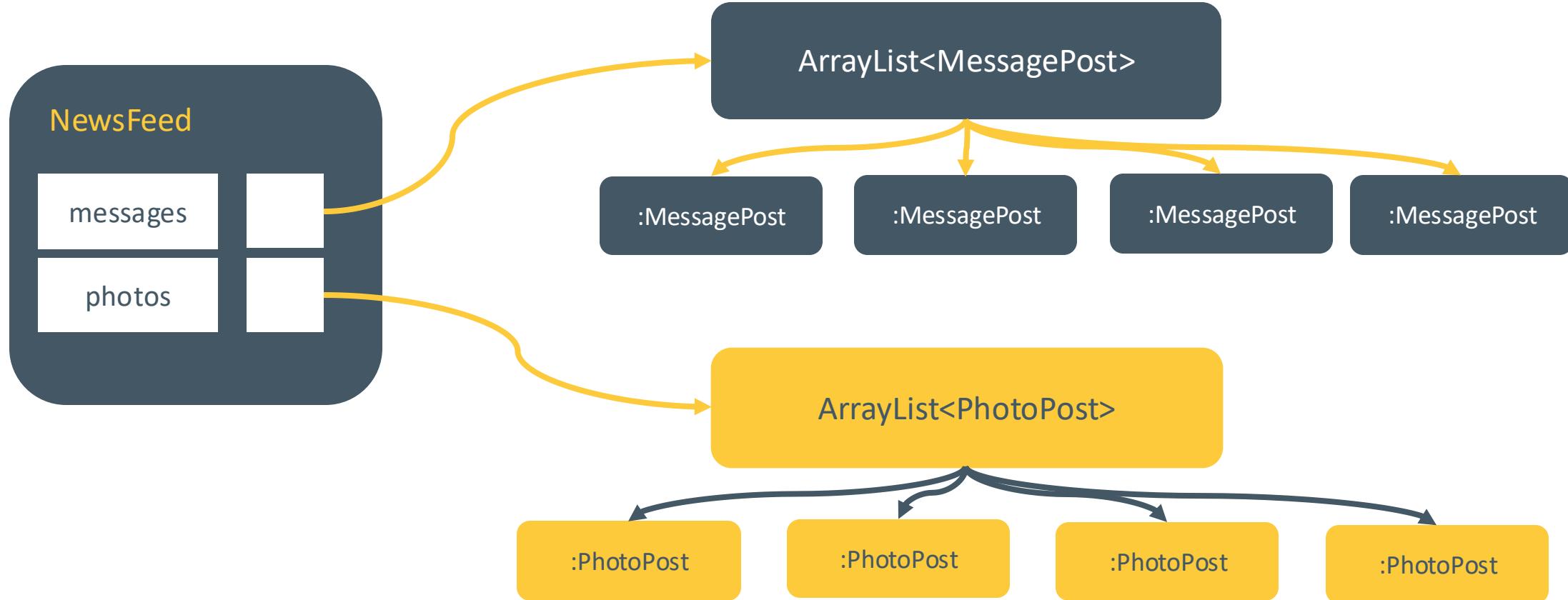
# Social Network V4.0 – Class Structure



# Social Network V4.0 – Class Structure



# Social Network V4.0 – CRUD on TWO ArrayLists



# Social Network V3.0 versus V4.0 (NewsFeed)

V3.0

c NewsFeed

- m NewsFeed()
- m addPost(MessagePost): boolean
- m show(): String
- m deleteMessagePost(int): MessagePost
- m updateMessagePost(int, String, String): boolean
- m findMessagePost(int): MessagePost
- m numberOfPosts(): int
- m load(): void
- m save(): void
- m isValidIndex(int): boolean
- f posts: ArrayList<MessagePost>

V4.0

c NewsFeed

- m NewsFeed()
- m addMessagePost(MessagePost): boolean
- m addPhotoPost(PhotoPost): boolean
- m show(): String
- m showPhotoPosts(): String
- m showMessagePosts(): String
- m deleteMessagePost(int): MessagePost
- m deletePhotoPost(int): PhotoPost
- m updateMessagePost(int, String, String): boolean
- m updatePhotoPost(int, String, String, String): boolean
- m findMessagePost(int): MessagePost
- m findPhotoPost(int): PhotoPost
- m numberOfMessagePosts(): int
- m numberOfPhotoPosts(): int
- m load(): void
- m save(): void
- m isValidMessagePostIndex(int): boolean
- m isValidPhotoPostIndex(int): boolean
- f messagePosts: ArrayList<MessagePost>
- f photoPosts: ArrayList<PhotoPost>

# Social Network V3.0 versus V4.0 (NewsFeed)

V3.0

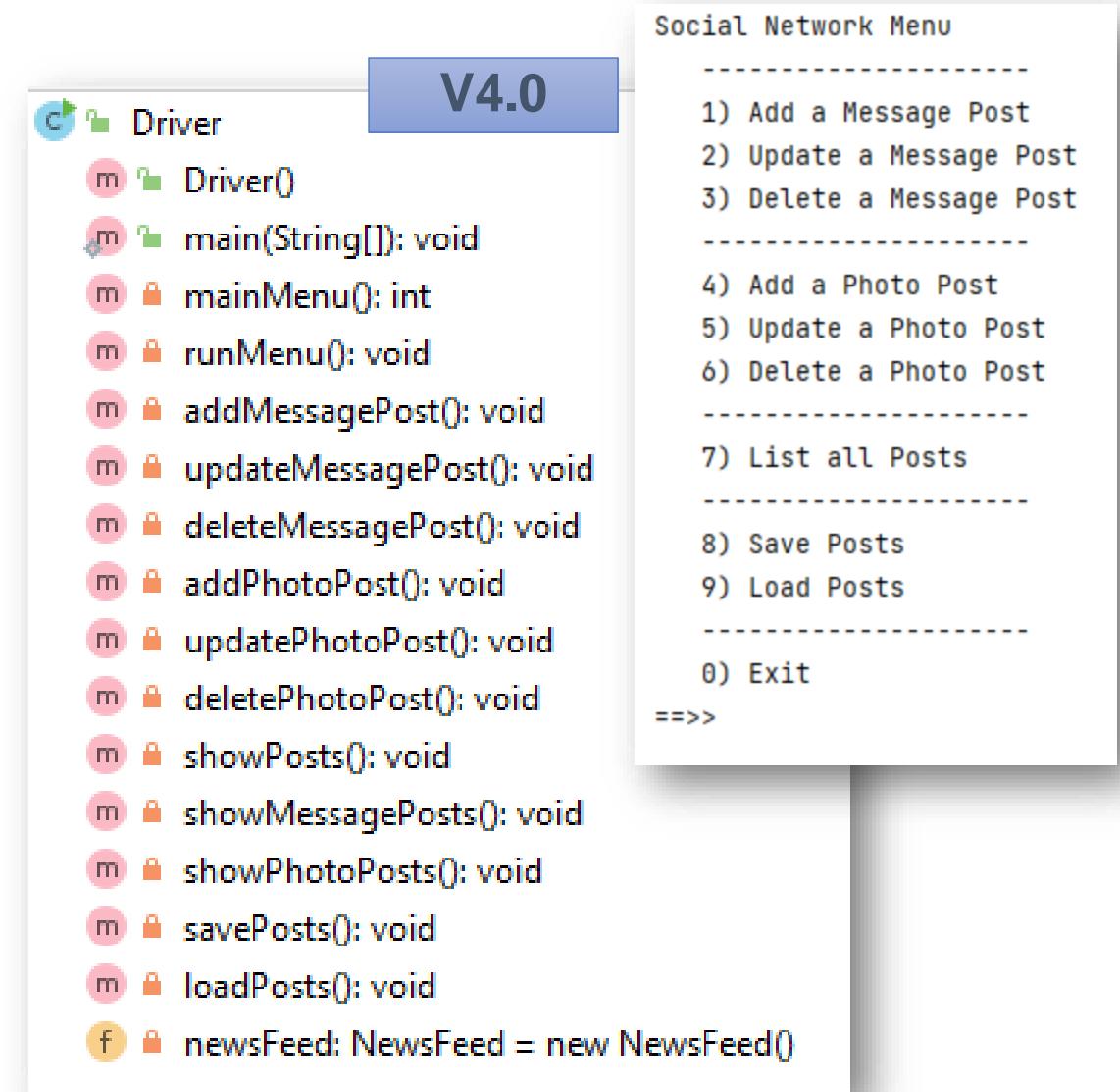
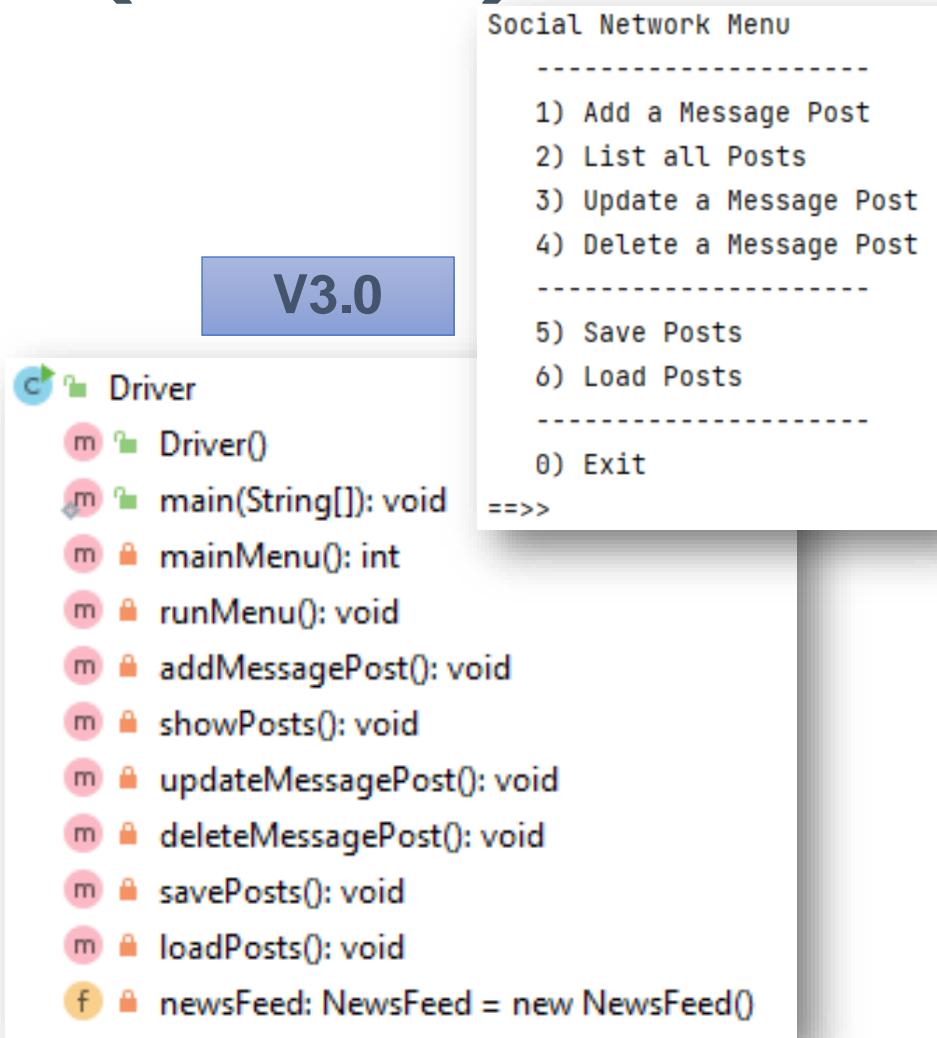
```
c  NewsFeed
m  NewsFeed()
m  addPost(MessagePost): boolean
m  show(): String
m  deleteMessagePost(int): MessagePost
m  updateMessagePost(int, String, String): boolean
m  findMessagePost(int): MessagePost
m  numberOfPosts(): int
m  load(): void
m  save(): void
m  isValidIndex(int): boolean
f  posts: ArrayList<MessagePost>
```

To handle the two ArrayLists, our NewsFeed methods have grown significantly e.g. delete now has two methods!

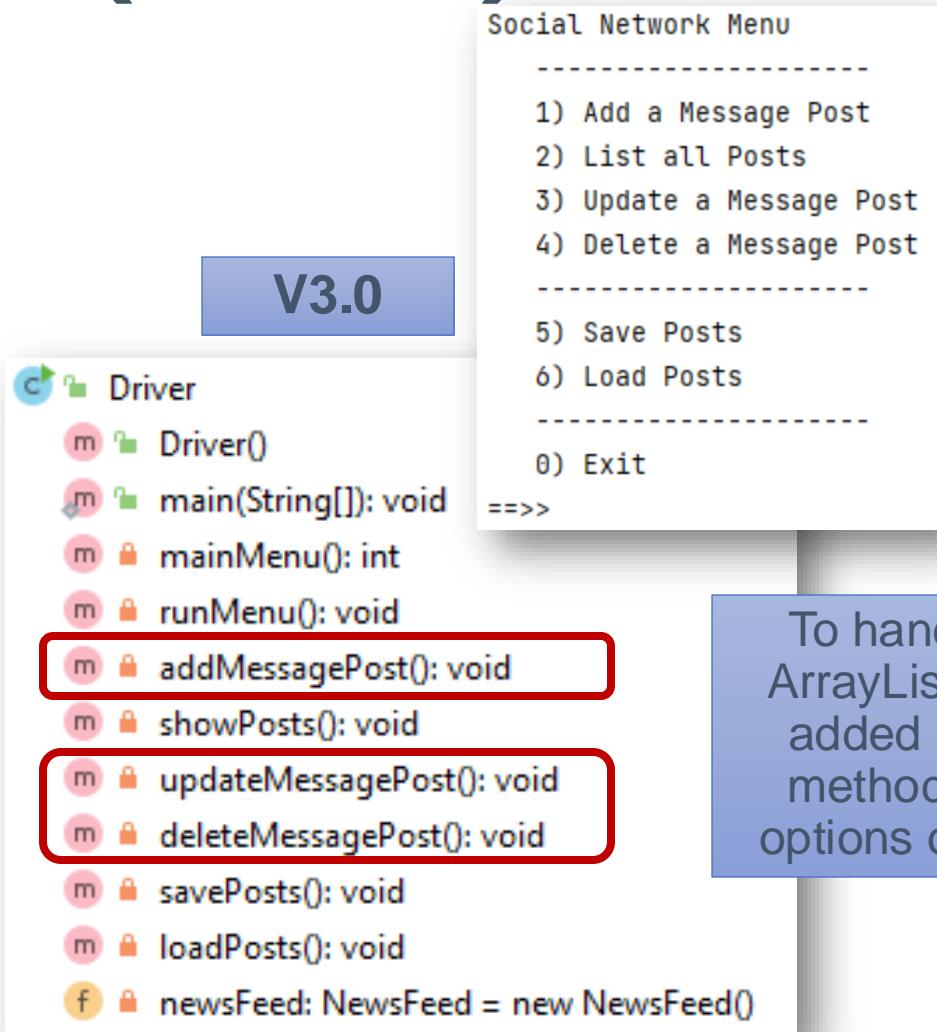
V4.0

```
c  NewsFeed
m  NewsFeed()
m  addMessagePost(MessagePost): boolean
m  addPhotoPost(PhotoPost): boolean
m  show(): String
m  showPhotoPosts(): String
m  showMessagePosts(): String
m  deleteMessagePost(int): MessagePost
m  deletePhotoPost(int): PhotoPost
m  updateMessagePost(int, String, String): boolean
m  updatePhotoPost(int, String, String, String): boolean
m  findMessagePost(int): MessagePost
m  findPhotoPost(int): PhotoPost
m  numberOfMessagePosts(): int
m  numberOfPhotoPosts(): int
m  load(): void
m  save(): void
m  isValidMessagePostIndex(int): boolean
m  isValidPhotoPostIndex(int): boolean
f  messagePosts: ArrayList<MessagePost>
f  photoPosts: ArrayList<PhotoPost>
```

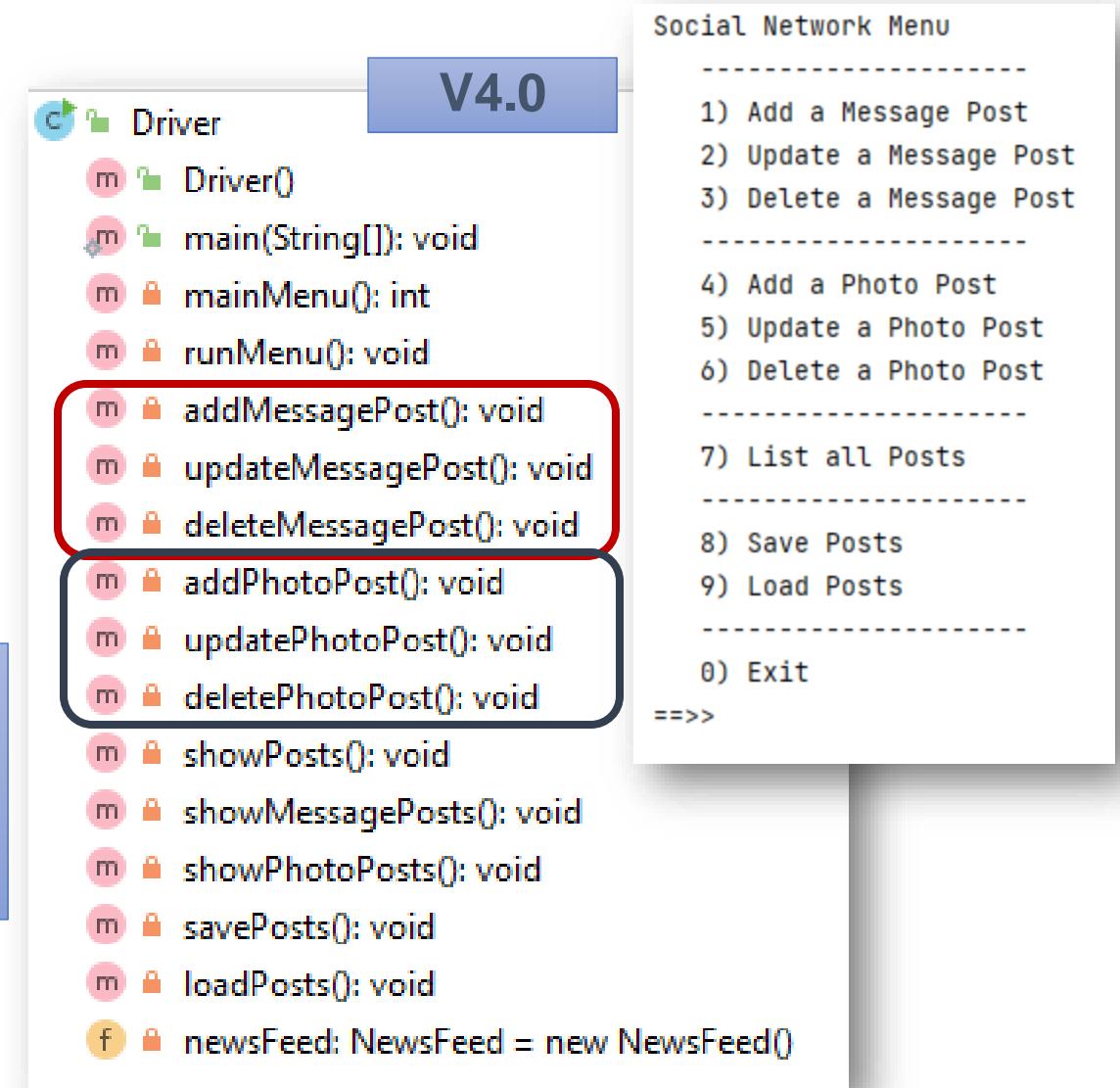
# Social Network V3.0 versus V4.0 (Driver)



# Social Network V3.0 versus V4.0 (Driver)



To handle the two ArrayLists, we have added new Driver methods and new options on the menu



# Shop Network V4.0 – NewsFeed – show() method

```
public String show() {  
    String str = "";  
  
    for(MessagePost messagePost : messagePosts) {  
        str += messagePosts.indexOf(messagePost) + ": " + messagePost.display() + "\n";  
    }  
  
    for(PhotoPost photoPost : photoPosts) {  
        str += photoPosts.indexOf(photoPost) + ": " + photoPost.display() + "\n";  
    }  
  
    if (str.isEmpty()){  
        return "No Posts";  
    }  
    else {  
        return str;  
    }  
}
```

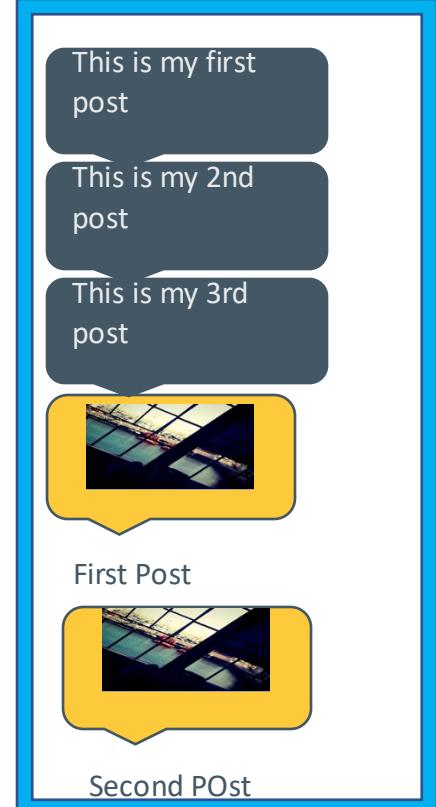
```
public class NewsFeed {  
  
    private ArrayList<MessagePost> messagePosts;  
    private ArrayList<PhotoPost> photoPosts;
```

# Shop Network V4.0 – NewsFeed – show() method

```
public String show() {  
    String str = "";  
  
    for(MessagePost messagePost : messagePosts) {  
        str += messagePosts.indexOf(messagePost) + ":" + messagePost.display() + "\n";  
    }  
  
    for(PhotoPost photoPost : photoPosts) {  
        str += photoPosts.indexOf(photoPost) + ":" + photoPost.display() + "\n";  
    }  
  
    if (str.isEmpty()){  
        return "No Posts";  
    }  
    else {  
        return str;  
    }  
}
```

```
public class NewsFeed {  
  
    private ArrayList<MessagePost> messagePosts;  
    private ArrayList<PhotoPost> photoPosts;
```

**Problem:** The posts are not displayed in the order they were added, all the messages are displayed first, followed by the photos.



# Critique of Social Network V4.0

- Code duplication:
  - **MessagePost** and **PhotoPost** classes very similar (large parts are identical)
  - makes maintenance difficult/more work
  - introduces danger of bugs through incorrect maintenance
- Code duplication in **NewsFeed** and **Driver** classes as well.
- We need a better solution → **Inheritance!**

# Now Let's Introduce Inheritance!