Inheritance

Exploring Polymorphism

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Lectures and 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 (https://www.bluej.org/objects-first/)

Topic List

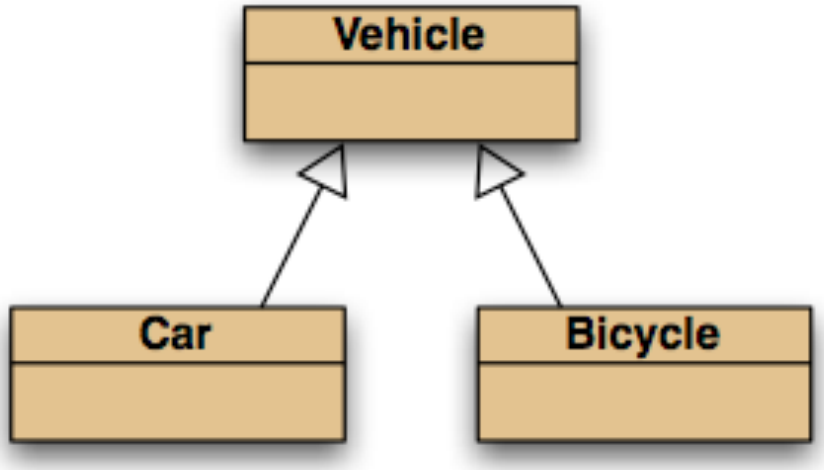
1. Method polymorphism
   - E.g. display()
2. Static and dynamic type
3. Overriding
4. Dynamic method lookup
5. Protected access

Static type and dynamic type

- A more complex type hierarchy requires further concepts to describe it.

- Some new terminology:
  - **static** type
  - **dynamic** type
  - **method dispatch/lookup**

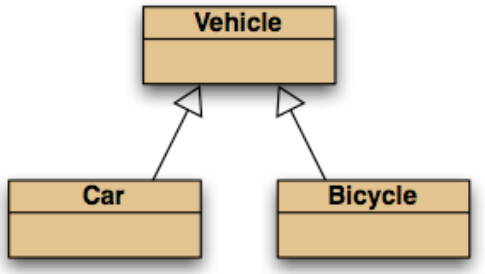
Lets revisit our vehicle example…



***sub**class objects*
may be assigned to
***super**class variables*

```
Vehicle v1 = new Vehicle();
Vehicle v2 = new Car();
Vehicle v3 = new Bicycle();
```

Static and dynamic **type**



What is the type of c1?

```
Car c1 = new Car();
```

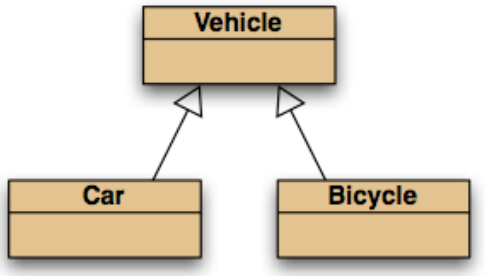
The declared type of a variable is its ***static*** *type*.

What is the type of v1?

```
Vehicle v1 = new Car();
```

The type of the object a variable refers to is its ***dynamic*** *type*.

Static and dynamic **type**



*The compiler's job is to check for **static-type violations**.*

What is the type of **v1**?

```
Vehicle v1 = new Car();
```

The declared type of a variable is its *static type*.

The type of the object a variable refers to is its *dynamic type*.

Vehicle

Car

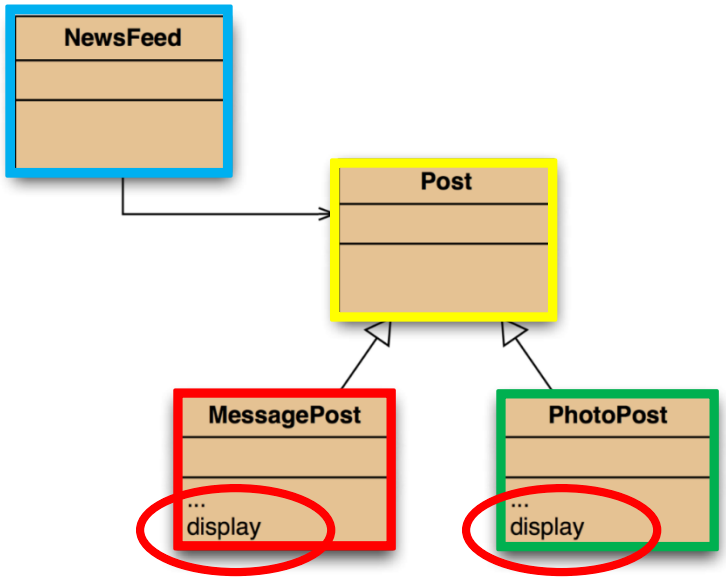
Recall our attempt to solve this problem…

```
Leonardo da Vinci
Had a great idea this morning.
But now I forgot what it was. Something to do with flying ...
40 seconds ago - 2 people like this.
  No comments.

Alexander Graham Bell
[experiment.jpg]
I think I might call this thing 'telephone'.
12 minutes ago  -  4 people like this.
  No comments.
```

```
Leonardo da Vinci
40 seconds ago  -  2 people like this.
  No comments.

Alexander Graham Bell
12 minutes ago  -  4 people like this.
  No comments.
```

message **filename** **caption** are missing from what we have. **i.e. the subclass specific fields**

Recall our attempt to solve this problem…



We placed **`display()`** in each subclass where it has access to the information it needs.

But:

- `Post`'s fields are private and `NewsFeed` cannot find a **`display()`** method in `Post`.

```
for(Post post : posts) {
  post.display();
                    // But there is no display() method in Post
                    //
                    // Compile-time error (static-type violation)
                    //
                    // because method display() is not found
                    // in the Post class
  }
```

Any Questions?