LEC 14

CSE 122

Interfaces

BEFORE WE START

Talk to your neighbors:

What is your most-used emoji?

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TAs

Ambika	Evelyn	Poojitha
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Audrey	Jaylyn	Rucha
Autumn	Jin	Shivani
Ayush	Joe	Shreya
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Colton	Leon	Suhani
Di	Megana	Yijia
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Questions during Class?

Raise hand or send here

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Lecture Outline

- **Announcements** ◀
- Interfaces Review
- More Shapes!
- Comparable

Announcements

- C2 due tomorrow (Thurs, May 18)
- P3 will be released on Fri, May 19
- Quiz 2 next Tuesday (May 23)
- Reminder that the final exam is scheduled for **Tuesday (June 6) 2:30pm-4:20pm**

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(PCM) Interfaces

Interfaces - define a set of *behavior* which classes can implement

… like a "certification", eg `ArrayList` is "certified" as a `List` because it can do all `List` behaviors.

note: interfaces say nothing about a class' *state*

(PCM) `List` Interface

`List` is an interface – defines the *behaviors* which make something a List, inc:

`add`, `clear`, `contains`, `get`, `isEmpty`, `size`

Any class with these behaviors can implement `List`

List documentation enumerates the full list of methods required to be a List:
https://docs.oracle.com/javase/8/docs/api/java/util/List.html

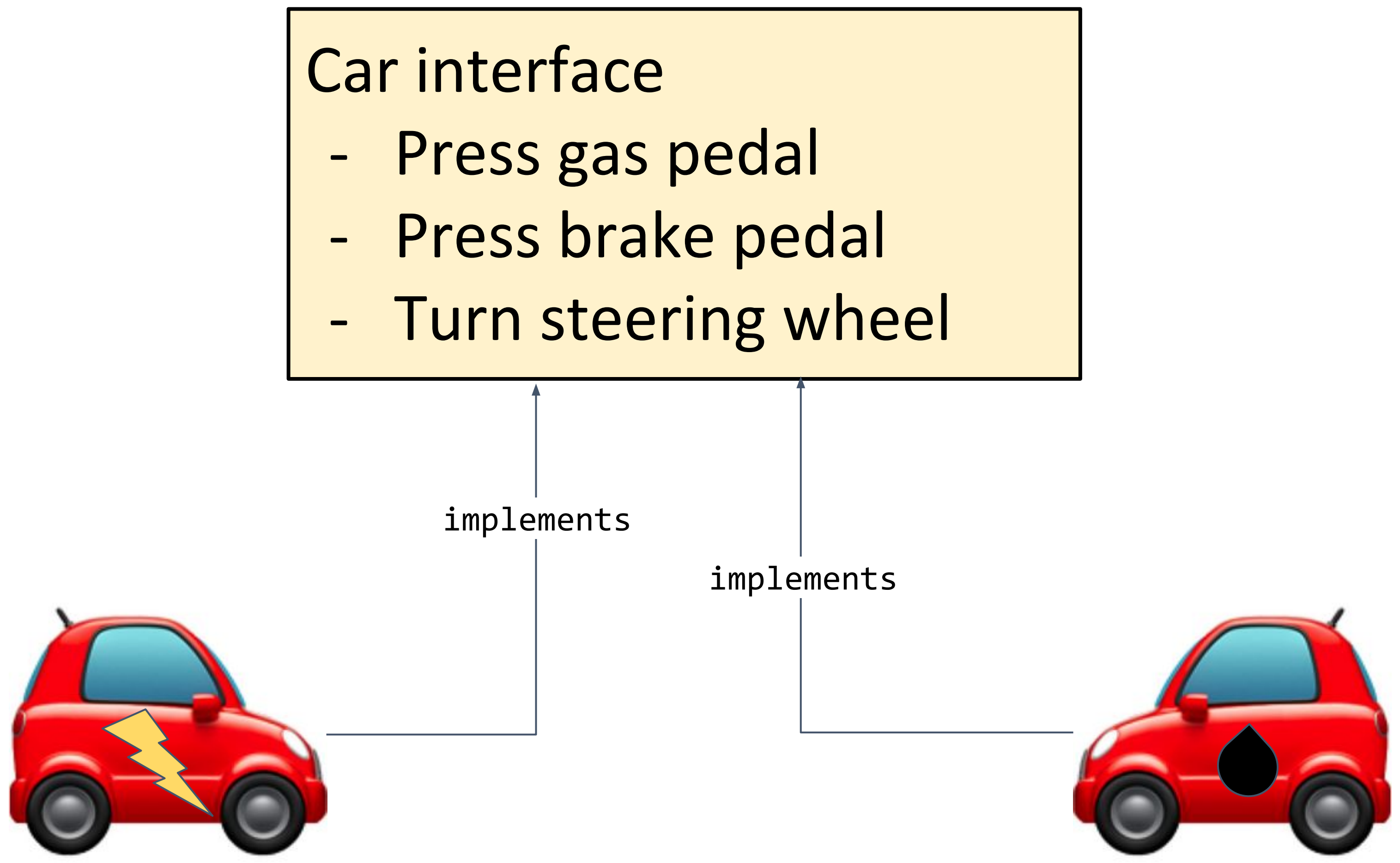
(PCM) Why interfaces?

Abstraction

Interfaces support *abstraction*

(the separation of ideas from details)

(PCM) Why interfaces?


Car interface
- Press gas pedal
- Press brake pedal
- Turn steering wheel

(PCM) Why interfaces?

Flexibility

```
public static void driveToWork(Car c) {…}
```

This method does not need to change if we update our implementation of `Car`

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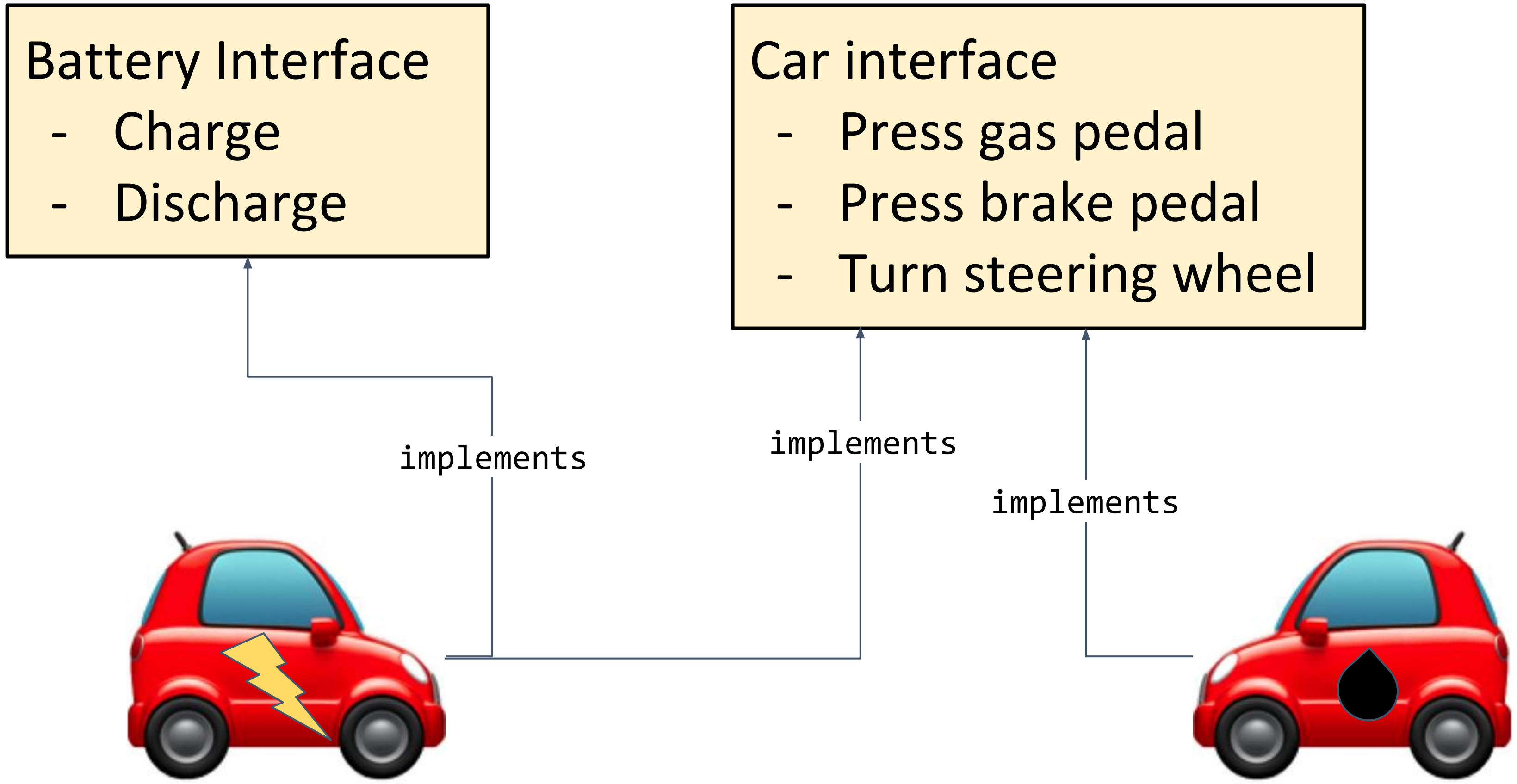
Classes can Implement Multiple Interfaces

A class can implement multiple interfaces – must include all *behaviors* from each interface it implements



Classes can Implement Multiple Interfaces

```
public class Leaf implements Car, Battery {
    ...
}
```

But `Leaf` would have to implement:

- `pushGasPedal`, etc from `Car`

  AND

- `charge`, `discharge` from `Battery`

An interface can extend another

You can have one interface *extend* another

So if `public interface A extends B`, then to implement A a class needs to have all methods from A and B.

In the above example, A is *more specific* than B

An interface can extend another

We can write another interface

`Polygon` that extends `Shape`

- `Square` is a `Polygon` (and `Shape`)
- `Triangle` is a `Polygon` (and `Shape`)
- `Circle` is a `Shape` (but *not* a `Polygon`)

Practice : Think

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Select all of the following statements that would cause an error.

```
public interface A {
    public void a();
}

public interface B extends A {
    public void b();
}

public interface C {
    public void c();
}

public interface D extends A {
    public void d();

    public void e();
}
```

```
public class One implements A {
    ...
}

public class Two implements B, D {
    ...
}

public class Three implements B, C {
    ...
}
```

A)
```
B foo = new Two();
foo.b();
```

B)
```
D bar = new Two();
bar.a();
```

C)
```
D baz = new Three();
baz.a();
```

D)
```
A waldo = new Three();
waldo.b();
```

Practice : Pair

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Select all of the following statements that would cause an error.

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    public void a();
}

public interface B extends A {
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    public void c();
}

public interface D extends A {
    public void d();

    public void e();
}
```

```
public class One implements A {
    ...
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public class Two implements B, D {
    ...
}

public class Three implements B, C {
    ...
}
```

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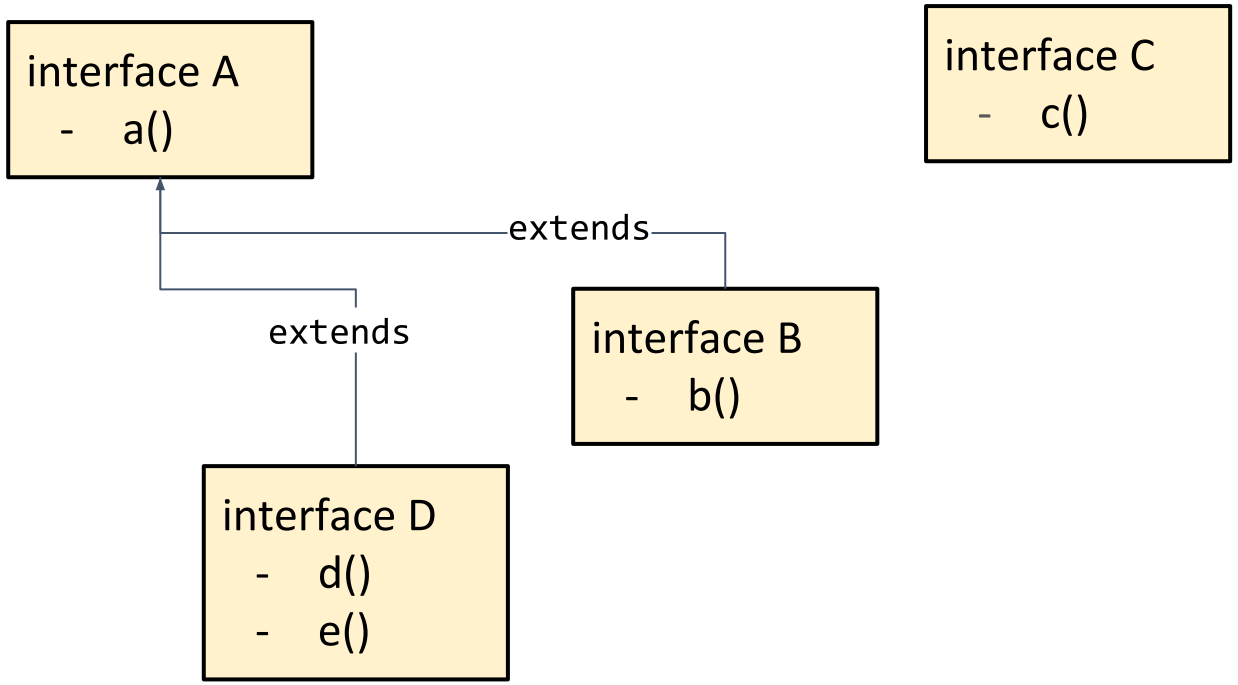

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```
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public class Two implements B, D {
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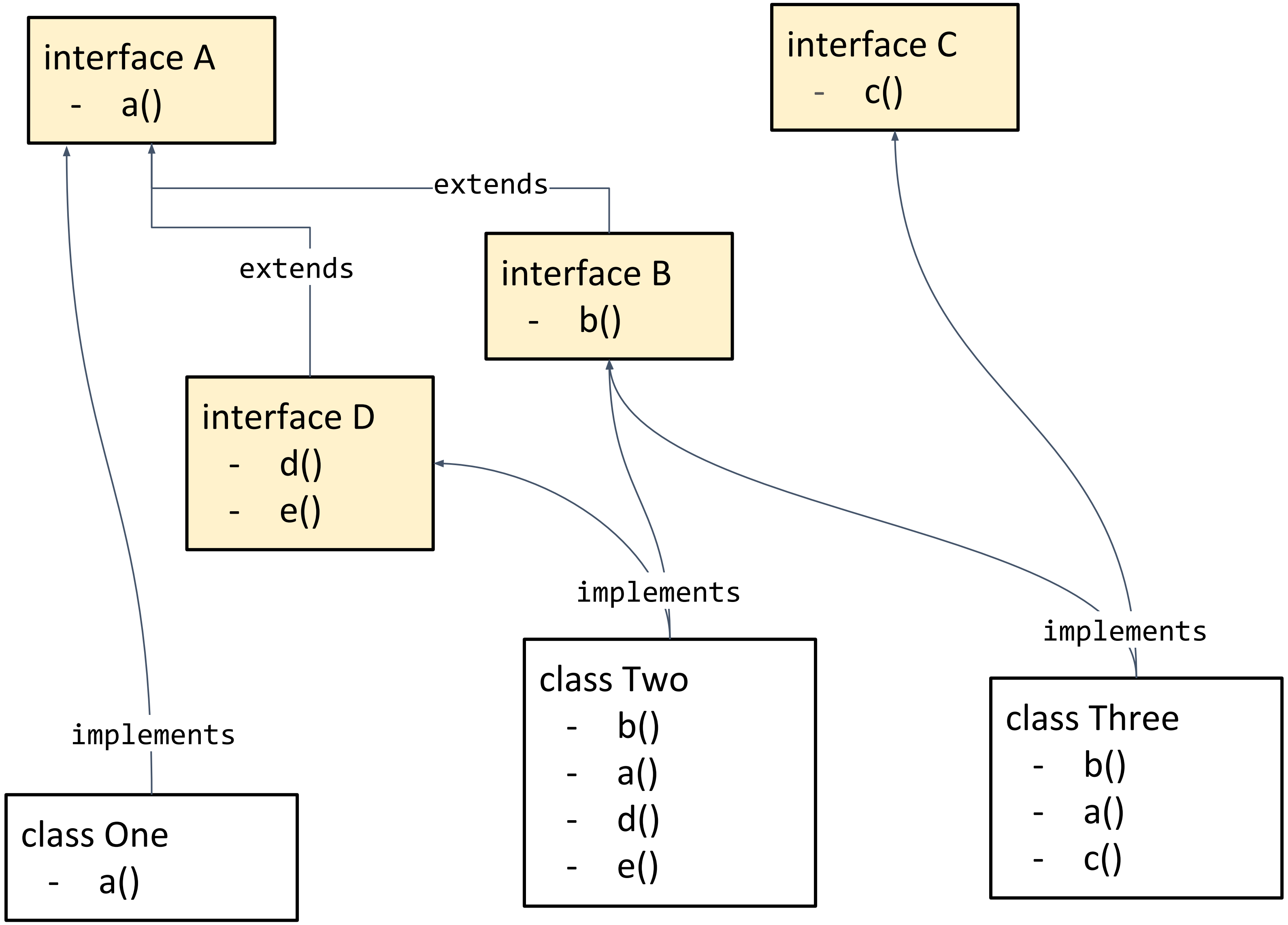

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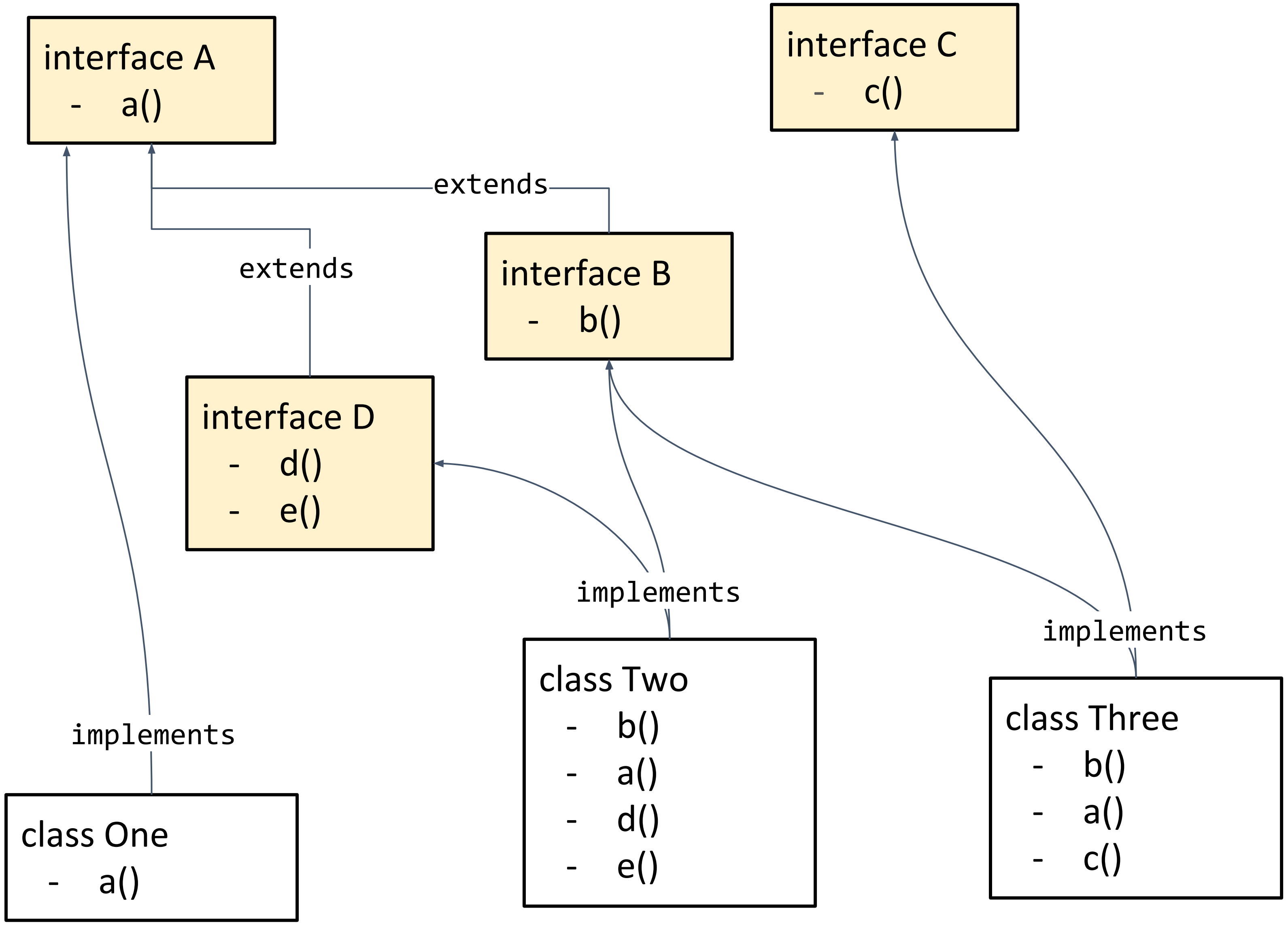

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- **Comparable**

Recall the Student / Course Example from Wed

Course stored a field

```
    private List<Student> roster;
```

We also had a suggestion to use a `Set` to store the students…

Seems like a great idea (no duplicates, not worried about keeping a specific order or indexing into it) but … Java reasons

- `HashSet` won't work because of the `hashCode()` business I mentioned on Wed
- `TreeSet` won't work because what does it mean to "sort" `Students`

Comparable

`TreeSet` uses an *interface* called `Comparable<E>` to know how to sort its elements

Only has one required method:

```
    public int compareTo(E other)
```

Its return value is:

```
< 0  if this is "less than" other
  0  if this is equal to other
> 0  if this is "greater than" other
```

`Comparable documentation:`
https://docs.oracle.com/javase/8/docs/api/java/lang/Comparable.html