LEC 15

CSE 122

Collections

Questions during Class?

Raise hand or send here

sli.do #cse122

BEFORE WE START

Talk to your neighbors:

What are you going to do during the 3 day weekend?

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TAs: Andrew, Anya, Brittan, Carson, Christopher, Colin, Dalton, Daniel, Diya, Elizabeth, Ivory, Jack, Jacob, Ken, Kyle, Leo, Logan, Mahima, Medha, Minh, Nicole, Samuel, Shivani, Sreshta, Steven, Yang

Lecture Outline

- **Announcements**
- Optional
- Recap of Collections
- Dumb Data Structures
- Collections

Announcements

- Resubmission Cycle 5 (R5) out; due May 27th by 11:59 PM
- Programming Assignment 3 (P3) out tonight!
  - Due May THURSDAY 29th by 11:59 PM
- Quiz 2 Tuesday, May 27th
  - Quiz 1 grades out soon!

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Optional

`Optional` is a Java class that is used to handle situations where a value is <u>sometimes</u> there.

- A variable that can *sometimes* be initialized, based on situation
- `Optional<String> keepPlaying = Optional.empty();`
- `Optional<Integer> maxValue = Optional.of(-1);`

Like a collection, Optional uses <> to denote the type it contains..

- e.g., `Optional<String>`, `Optional<Integer>`, `Optional<Point>`

Optional Methods

Method	Description
`Optional.empty()`	Creates an empty `Optional` object
`Optional.of(…)`	Creates an `Optional` object holding the object it's given
`isEmpty()`	Returns `true` if there *is no* value stored, and `false` otherwise
`isPresent()`	Returns `true` if there *is* a value stored, and `false` otherwise
`get()`	Returns the stored object from the `Optional` (if one is stored; otherwise throws a `NoSuchElementException`)

The `Optional` class has more than just these methods, but these are what you'll need to focus on for this class!

Note on Optional Methods

`isEmpty()`, `isPresent()`, and `get()` are called like normal instance methods (on an **actual** instance of `Optional`).

Example: `keepPlaying.isEmpty()`

`Optional.of(…)` and `Optional.empty()` are static and thus called differently (Like the `Math` class methods)

Example: `Optional.empty();`

Why Optional?

Using `Optional` can help programmers avoid `NullPointerExceptions` by making it explicit when a variable may or may not contain a value.

- Remember – `null` refers to the complete absence of an object!

There are other `Optional` methods (that you should explore in your own time if you're interested) that can be really useful to cleanly work with data that may or may not be present.

Student / Course Example one more time…

Let's add two more methods to `Course.java`:

```
public void setCourseEvalLink(String url)

public Optional<String> getCourseEvalLink()
```

The link to the evaluations for a course doesn't usually exist until the last few weeks of the quarter. What if a client calls `getCourseEvalLink` before one is set up?

`Optional` to the rescue! 🦸‍♀️

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Goal for Today

Review some of the data structures we've talked about this quarter

Understand how Java organizes them with *interfaces*

Collections: What classes have we seen so far?

…

Array,
ArrayList,
LinkedList,
Stack,
HashSet & HashMap,
TreeSet & TreeMap

Collections: What interfaces have we seen so far?

…

Set,
Queue,
List,
Comparable

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Dumb Data Structures

We're going to create our own versions of these classes so we can dig into how they all relate to each other!

BUT they're going to be real dumb.

If you want to get a sense of how they're *actually* implemented, go take CSE 123!

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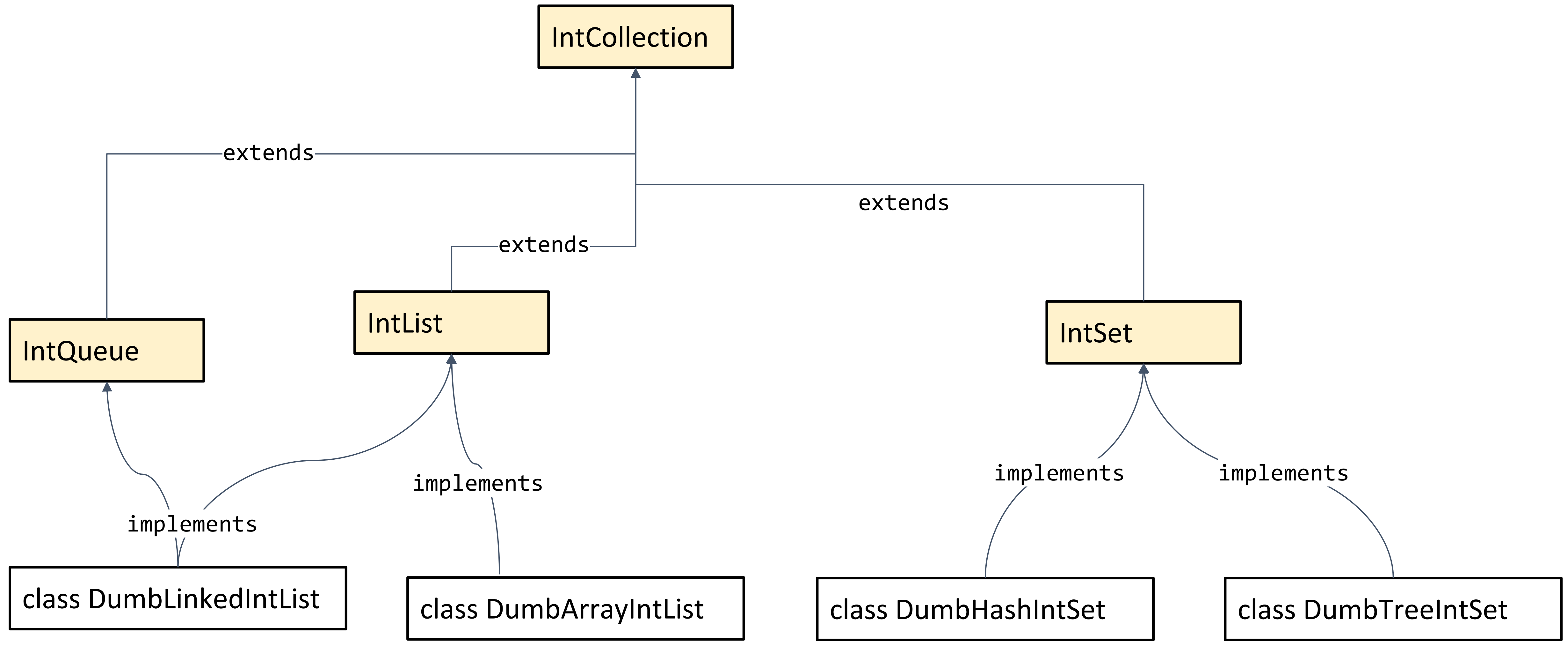
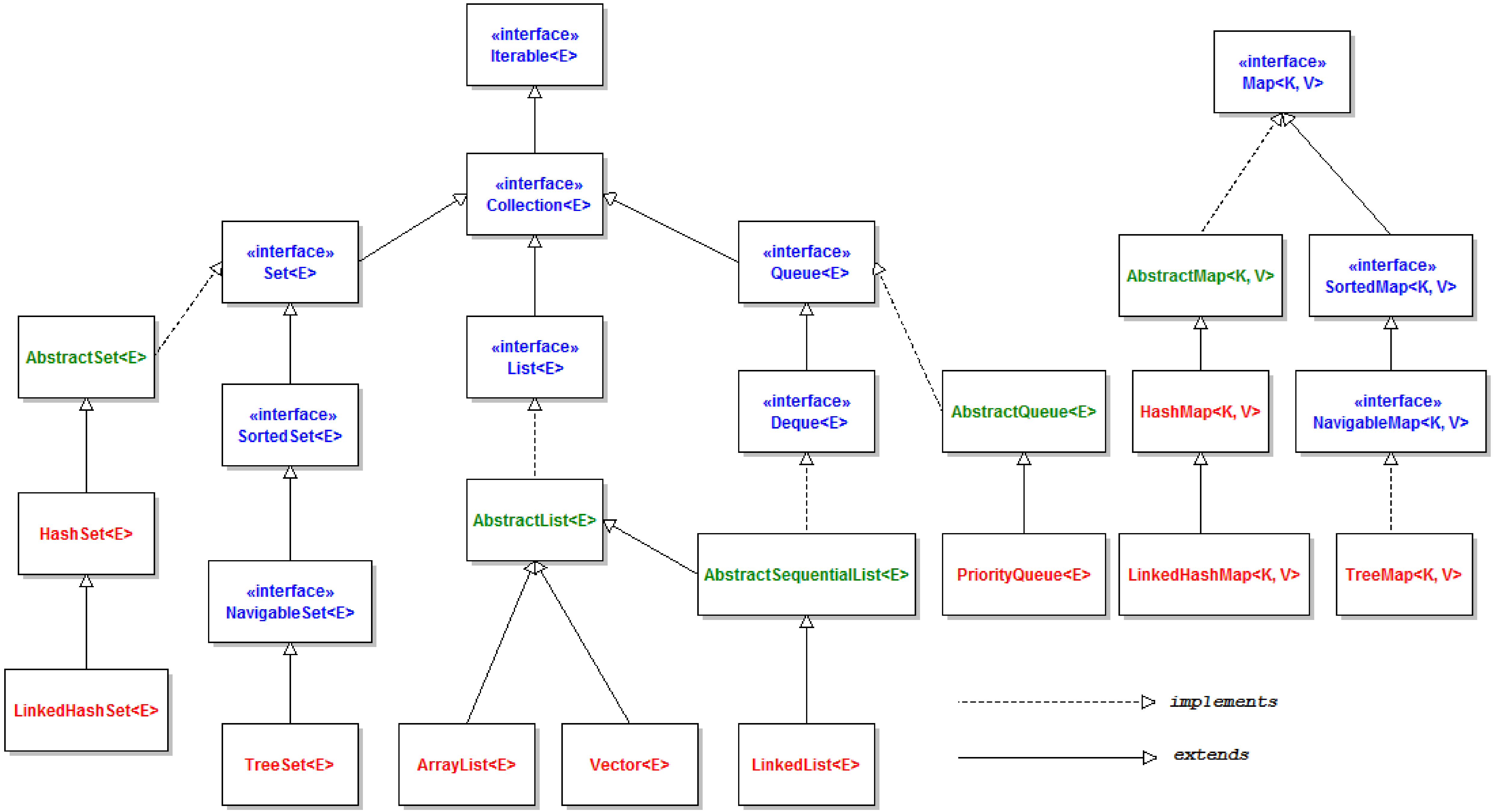
IntCollection Relationships




«interface» Iterable<E>
«interface» Collection<E>
«interface» Set<E>
«interface» List<E>
«interface» Queue<E>
«interface» Map<K, V>
AbstractSet<E>
«interface» SortedSet<E>
AbstractList<E>
«interface» Deque<E>
AbstractQueue<E>
AbstractMap<K, V>
«interface» SortedMap<K, V>
HashMap<K, V>
«interface» NavigableMap<K, V>
HashSet<E>
«interface» NavigableSet<E>
AbstractSequentialList<E>
PriorityQueue<E>
LinkedHashMap<K, V>
TreeMap<K, V>
LinkedHashSet<E>
TreeSet<E>
ArrayList<E>
Vector<E>
LinkedList<E>
implements
extends