Week 1 Day 4

Java Data Structures

Data Structures

REVATURE

Data organization, management, and storage format that enables efficient access and modification

- Linear
  - Arranged in an orderly manner, each element is attached adjacently
- Hierarchical
  - Elements in sorted order with relationships between them

Java: Collections

REVATURE

Java's implementation of popular linear data structures

- MOST extend the Iterable interface
  - Iterable allows you to traverse the DS with an iterator
  - Iterator interface provides methods to do the traversal
- Collection Interfaces
  - List
  - Sets
  - Queue
  - *Map (doesn't extend Iterable but considered part of collections)

Java: Collections Hierarchy

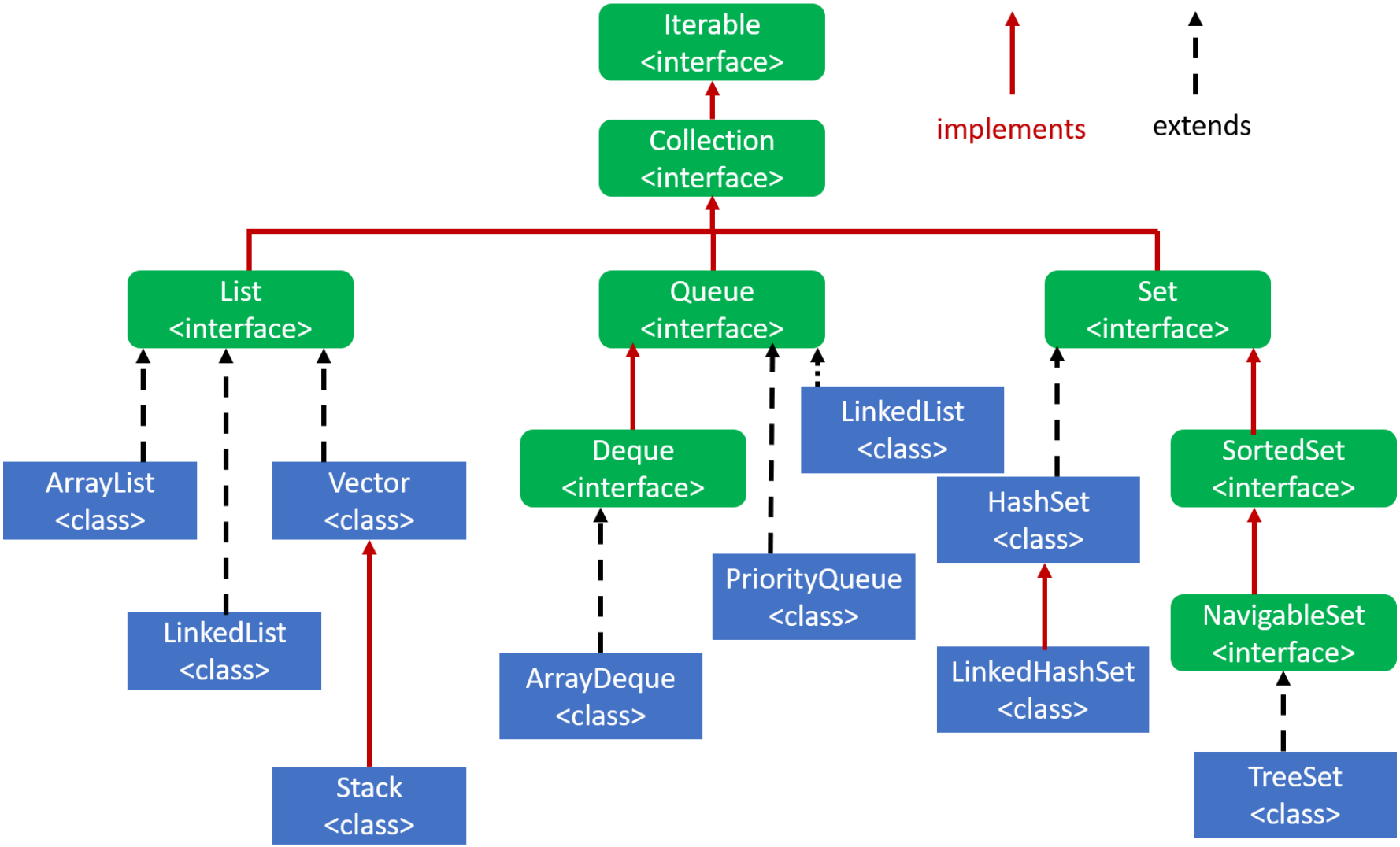


Image Source: https://bytesofgigabytes.com/java/collection-framework-in-java/

Java: Generics

REVATURE

Constructs which enforce compile time safety

- Placeholder for future datatype to be plugged into
- Declared on classes, methods, or return types
- Use <> angled brackets when declaring a class or interface to use a generic data type
- You will see this used often with Collections

Java: Wrapper Classes

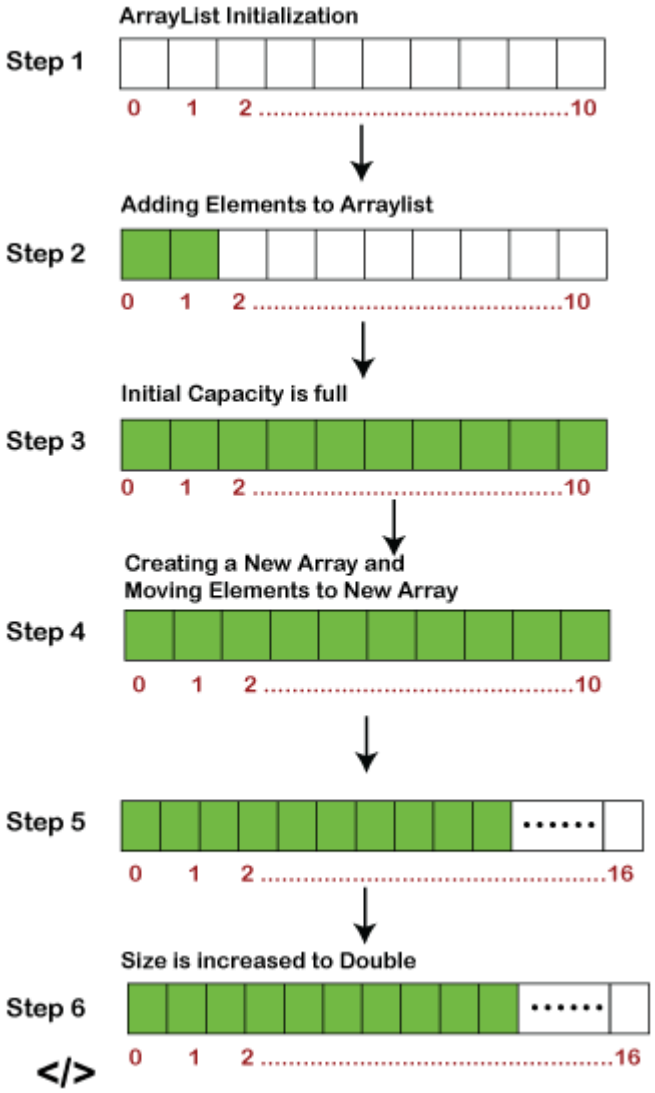
REVATURE

- Allow you to treat primitives as objects
- Autoboxing
  - Pass a primitive into a parameter asking for a wrapper
- Unboxing
  - Pass a wrapper into a parameter asking for a primitive

Primitive	Wrapper Class
boolean	Boolean
byte	Byte
short	Short
char	Character
int	Integer
long	Long
float	Float
double	Double

Lists: ArrayList

- List which contains an array
- Default size of 10
- Increases by 50%
- Quick traversal and retrieval
- Slow insertion and deletion



Lists: LinkedList

REVATURE

- List of nodes which contain data, and a reference to the next node
- Quick insertion and deletion
- Slower traversal/retrieval

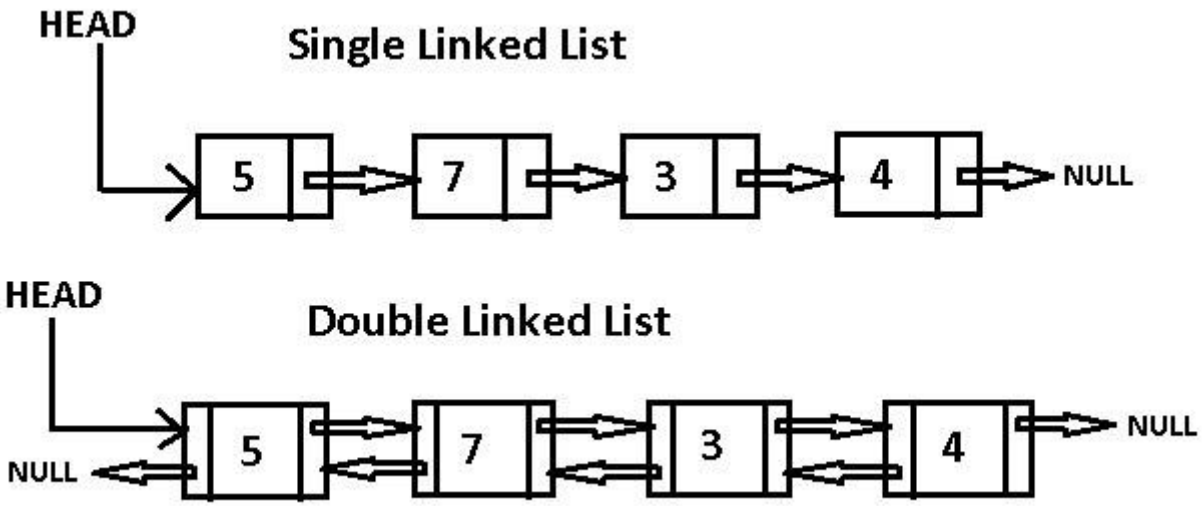


Image Source: https://medium.com/journey-of-one-thousand-apps/data-structures-in-the-real-world-508f5968545a

Sets: HashSet and TreeSet

REVATURE

- Set that is backed by a Hashmap
- No ordering when iterating
- One null value allowed
- Fast insertion and traversal

- Set that is backed by a SortedTree
- Sorted order
- No null values
- Slow insertion and deletion
- Faster retrieval

collections vs Collection vs Collections

REVATURE

A very common and tricky QC question

- collections
  - A collection of entities
- Collection
  - Interface in the Collection API
- Collections
  - Utility class that has static, convenient methods that operate on data structures in the Collections API

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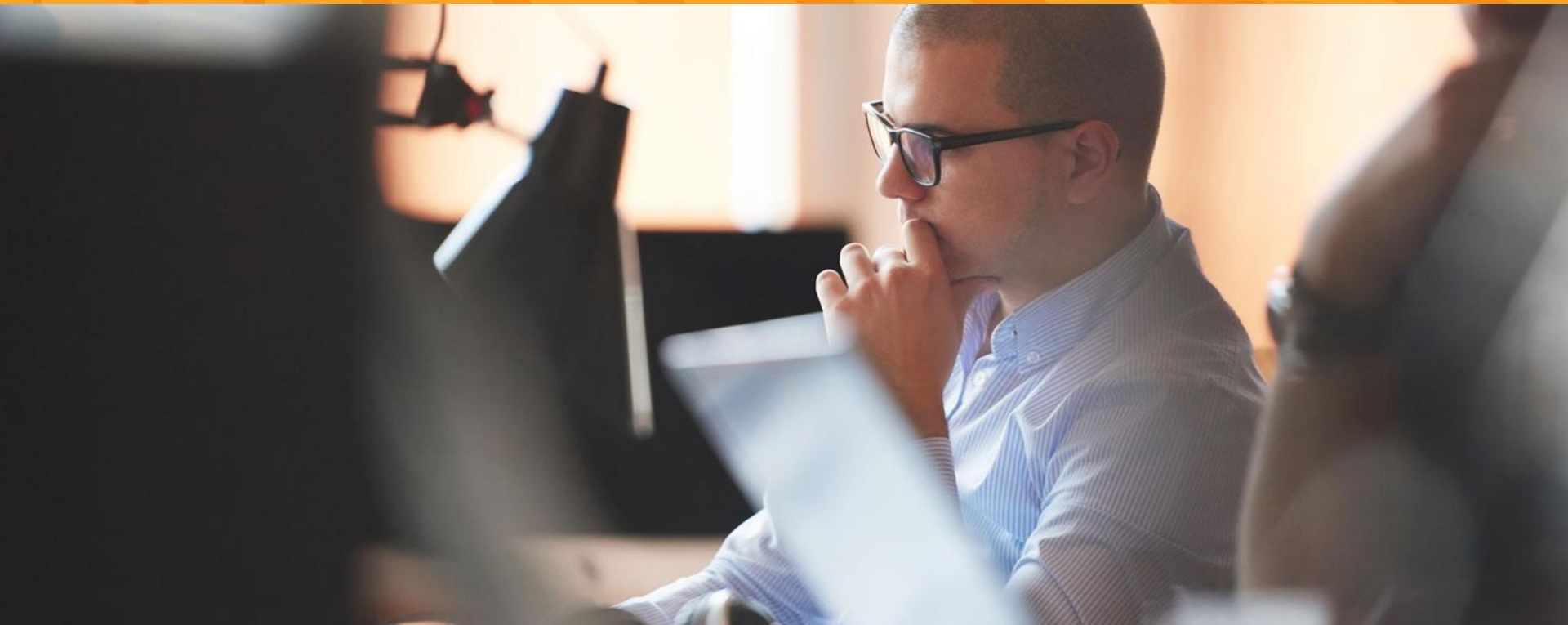
Generics and Collections DEMO



Java File Persistence

REVATURE

- Serialization
  - Writing objects to a byte stream
  - Deserialization is the opposite
- Serialization via File I/O
  - Streams
  - Reader/Writer
- File I/O Classes
  - FileInputStream/FileOutputStream
  - FileReader/FileWriter
  - BufferedReader/BufferedWriter

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Java Reading and Writing to File Demo

Java: Garbage Collection

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Java automatically removes objects from memory when no longer referenced

- Can’t tell Java to garbage collect
- Suggest it with
  - System.gc()
  - Runtime.getRuntim().gc()
  - System.runFinalize()

```
Object o1 = new Object(); // 1
Object o2 = new Object(); // 2
Object o3 = o1;           // 3
o2 = o3;                  // 4
```

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Java Garbage Collection Demo