Collections

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Collections in Java

- **Collections in java** is a framework that provides an architecture to store and manipulate the group of objects
- All the operations that you perform on a data such as searching, sorting, insertion, manipulation, deletion etc. can be performed by Java Collections
- Collection represents a single unit of objects i.e. a group
- **What is framework in java**
  - provides readymade architecture
  - represents set of classes and interface
  - is optional
- **What is Collection framework**
  - Interfaces and its implementations i.e. classes
  - Algorithm

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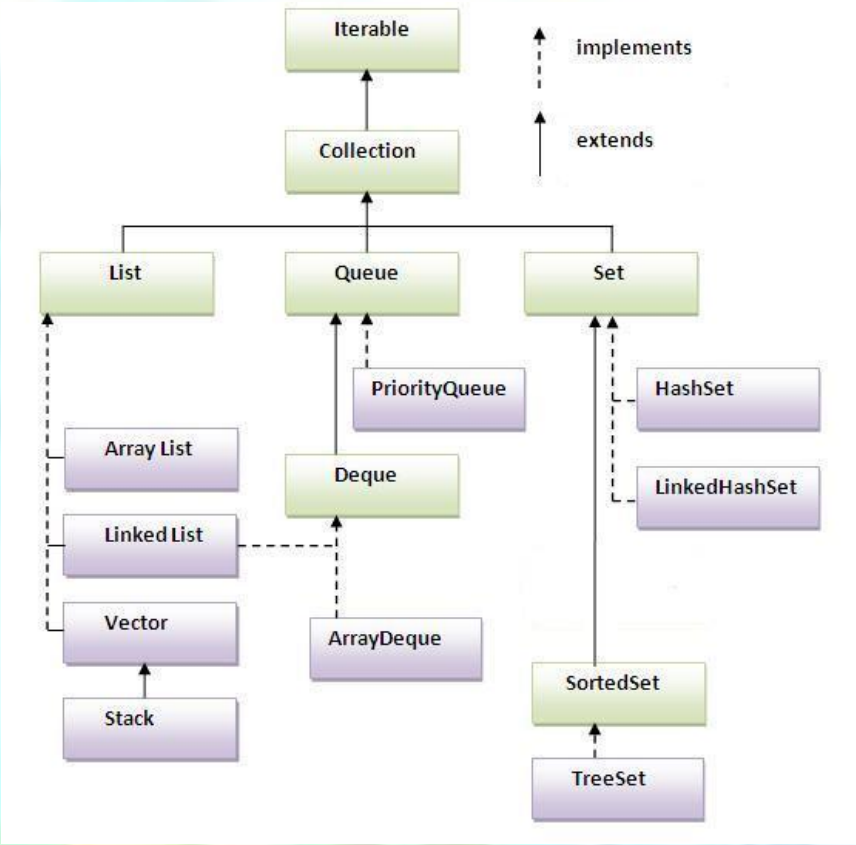
Hierarchy of Collection Framework

- The **java.util** package contains all the classes and interfaces for Collection framework



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ArrayList

- Uses a dynamic array for storing the elements
- Extends AbstractList class and implements List interface
- Can contain duplicate elements
- Maintains insertion order
- Allows random access because array works at the index basis
- Manipulation is slow because a lot of shifting needs to be occurred if any element is removed from the array list

Non-generic Vs Generic Collection

- Java collection framework was non-generic before JDK 1.5. Since 1.5, it is generic
- Generic collection allows you to have only one type of object in collection
- ArrayList al=new ArrayList();//creating old non-generic arraylist
- ArrayList<String> al=new ArrayList<String>();//creating new generic arraylist
- In generic collection, we specify the type in angular braces. Now ArrayList is forced to have only specified type of objects in it
- If you try to add another type of object, it gives *compile time error*

Example of ArrayList

- Example1
- Example 1 -> Convert in for-each loop
- Example2 (Class object Array List)
- **addAll(Collection c) method**
- **removeAll() method**
- **retainAll() method**

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LinkedList class

- Uses doubly linked list to store the elements
- Can contain duplicate elements
- Maintains insertion order
- Manipulation is fast because no shifting needs to be occurred
- Can be used as list, stack or queue

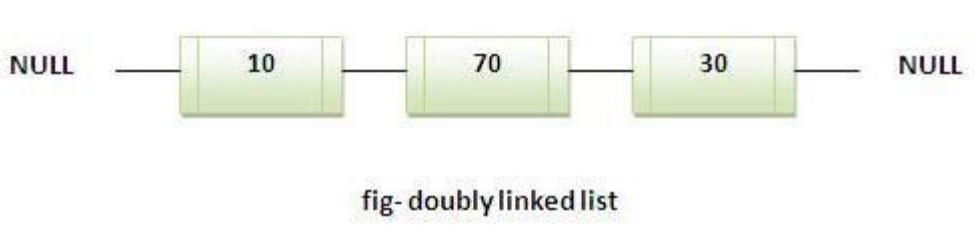

fig- doubly linked list

- Example LinkedList

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ArrayList vs LinkedList

ArrayList

1) ArrayList internally uses **dynamic array** to store the elements.

2) Manipulation with ArrayList is **slow** because it internally uses array. If any element is removed from the array, all the bits are shifted in memory.

3) ArrayList class can **act as a list** only because it implements List only.

4) ArrayList is **better for storing and accessing** data.

LinkedList

LinkedList internally uses **doubly linked list** to store the elements.

Manipulation with LinkedList is **faster** than ArrayList because it uses doubly linked list so no bit shifting is required in memory.

LinkedList class can **act as a list and queue** both because it implements List and Deque interfaces.

LinkedList is **better for manipulating** data.

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HashSet class

- Uses Hashtable to store the elements
- Contains unique elements only
- **Difference between List and Set**
  - List can contain duplicate elements whereas Set contains unique elements only
- Example

LinkedHashSet class

- Contains unique elements only like HashSe
- Maintains insertion order
- **Example of LinkedHashSet class**

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TreeSet class

- Contains unique elements only like HashSet
- Maintains ascending order
- **Example of TreeSet class**

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Map Interface

- A map contains values based on the key i.e. key and value pair
- Each pair is known as an entry
- Map contains only unique elements

HashMap class

- Contains values based on the key
- Contains only unique elements
- It may have one null key and multiple null values
- It maintains no order
- **Example of HashMap class**

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LinkedHashMap class

- Contains values based on the key
- It contains only unique elements
- It may have one null key and multiple null values
- It is same as HashMap instead maintains insertion order
- **Example of LinkedHashMap class**

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TreeMap class

- Contains values based on the key
- Contains only unique elements
- It cannot have null key but can have multiple null values
- It is same as HashMap instead maintains ascending order
- **Example of TreeMap class**

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HashMap vs TreeMap

1) HashMap is can contain one null key.	TreeMap can not contain any null key.
2) HashMap maintains no order.	TreeMap maintains ascending order.

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Comparable interface

- Used to order the objects of user-defined class.
- java.lang package
- Only one method named compareTo(Object)
- It provide only single sorting sequence i.e. you can sort the elements on based on single datamember only
  - For instance it may be either rollno,name,age or anything else
- We can sort the elements of:
  - String objects
  - Wrapper class objects
  - User-defined class objects
- **String class and Wrapper classes implements the Comparable interface. So if you store the objects of string or wrapper classes, it will be Comparable**
- **Example of Sorting the elements of List that contains user-defined class objects on age basis**

Comparator interface

- **Comparator interface** is used to order the objects of user-defined class
- Present in java.util package and contains 2 methods
  - compare(Object obj1,Object obj2)
  - equals(Object element)
- It provides multiple sorting sequence i.e. you can sort the elements based on any data member.
- Example of Comparator

Comparable vs Comparator

Comparable	Comparator
1) Comparable provides **single sorting sequence**. In other words, we can sort the collection on the basis of single element such as id or name or price etc.	Comparator provides **multiple sorting sequence**. In other words, we can sort the collection on the basis of multiple elements such as id, name and price etc.
2) Comparable **affects the original class** i.e. actual class is modified.	Comparator **doesn't affect the original class** i.e. actual class is not modified.
3) Comparable provides **compareTo() method** to sort elements.	Comparator provides **compare() method** to sort elements.
4) Comparable is found in **java.lang** package.	Comparator is found in **java.util** package.
5) We can sort the list elements of Comparable type by **Collections.sort(List)** method.	We can sort the list elements of Comparator type by **Collections.sort(List,Comparator)** method.

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Thanks…

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