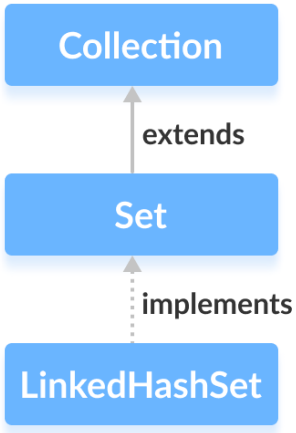
Java LinkedHashSet

In this tutorial, we will learn about the Java LinkedHashSet class and its methods with the help of examples.

The `LinkedHashSet` class of the Java collections framework provides functionalities of both the hashtable and the linked list data structure.

It implements the Set interface.



Elements of `LinkedHashSet` are stored in hash tables similar to HashSet.

However, linked hash sets maintain a doubly-linked list internally for all of its elements. The linked list defines the order in which elements are inserted in hash tables.

Create a LinkedHashSet

In order to create a linked hash set, we must import the `java.util.LinkedHashSet` package first.

Once we import the package, here is how we can create linked hash sets in Java.

```
// LinkedHashSet with 8 capacity and 0.75 load factor
LinkedHashSet<Integer> numbers = new LinkedHashSet<>(8, 0.75);
```

Here, we have created a linked hash set named `numbers`.

Notice, the part `new LinkedHashSet<>(8, 0.75)`. Here, the first parameter is **capacity** and the second parameter is **loadFactor**.

- **capacity** - The capacity of this hash set is 8. Meaning, it can store 8 elements.
- **loadFactor** - The load factor of this hash set is 0.6. This means, whenever our hash table is filled by 60%, the elements are moved to a new hash table of double the size of the original hash table.

Default capacity and load factor

It's possible to create a linked hash set without defining its capacity and load factor. For example,

```
// LinkedHashSet with default capacity and load factor
LinkedHashSet<Integer> numbers1 = new LinkedHashSet<>();
```

By default,

- the capacity of the linked hash set will be 16
- the load factor will be 0.75

Creating LinkedHashSet from Other Collections

Here is how we can create a linked hash set containing all the elements of other collections.

```java
import java.util.LinkedHashSet;
import java.util.ArrayList;

class Main {
    public static void main(String[] args) {
        // Creating an arrayList of even numbers
        ArrayList<Integer> evenNumbers = new ArrayList<>();
        evenNumbers.add(2);
        evenNumbers.add(4);
        System.out.println("ArrayList: " + evenNumbers);

        // Creating a LinkedHashSet from an ArrayList
        LinkedHashSet<Integer> numbers = new LinkedHashSet<>(evenNumbers);
        System.out.println("LinkedHashSet: " + numbers);
    }
}
```

Output

```
ArrayList: [2, 4]
LinkedHashSet: [2, 4]
```

Methods of LinkedHashSet

The `LinkedHashSet` class provides methods that allow us to perform various operations on the linked hash set.

Insert Elements to LinkedHashSet

- `add()` - inserts the specified element to the linked hash set
- `addAll()` - inserts all the elements of the specified collection to the linked hash set

For example,

```
import java.util.LinkedHashSet;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> evenNumber = new LinkedHashSet<>();

        // Using add() method
        evenNumber.add(2);
        evenNumber.add(4);
        evenNumber.add(6);
        System.out.println("LinkedHashSet: " + evenNumber);

        LinkedHashSet<Integer> numbers = new LinkedHashSet<>();

        // Using addAll() method
        numbers.addAll(evenNumber);
        numbers.add(5);
        System.out.println("New LinkedHashSet: " + numbers);
    }
}
```

Output

```
LinkedHashSet: [2, 4, 6]
New LinkedHashSet: [2, 4, 6, 5]
```

Access LinkedHashSet Elements

To access the elements of a linked hash set, we can use the `iterator()` method. In order to use this method, we must import the `java.util.Iterator` package. For example,

```
import java.util.LinkedHashSet;
import java.util.Iterator;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> numbers = new LinkedHashSet<>();
        numbers.add(2);
        numbers.add(5);
        numbers.add(6);
        System.out.println("LinkedHashSet: " + numbers);

        // Calling the iterator() method
        Iterator<Integer> iterate = numbers.iterator();

        System.out.print("LinkedHashSet using Iterator: ");

        // Accessing elements
        while(iterate.hasNext()) {
            System.out.print(iterate.next());
            System.out.print(", ");
        }
    }
}
```

Output

```
LinkedHashSet: [2, 5, 6]
LinkedHashSet using Iterator: 2, 5, 6,
```

Note:

- `hasNext()` returns `true` if there is a next element in the linked hash set
- `next()` returns the next element in the linked hash set

Remove Elements from HashSet

- `remove()` - removes the specified element from the linked hash set
- `removeAll()` - removes all the elements from the linked hash set

For example,

```java
import java.util.LinkedHashSet;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> numbers = new LinkedHashSet<>();
        numbers.add(2);
        numbers.add(5);
        numbers.add(6);
        System.out.println("LinkedHashSet: " + numbers);

        // Using the remove() method
        boolean value1 = numbers.remove(5);
        System.out.println("Is 5 removed? " + value1);

        boolean value2 = numbers.removeAll(numbers);
        System.out.println("Are all elements removed? " + value2);
    }
}
```

Output

```
LinkedHashSet: [2, 5, 6]
Is 5 removed? true
Are all elements removed? true
```

Set Operations

The various methods of the `LinkedHashSet` class can also be used to perform various set operations.

Union of Sets

Two perform the union between two sets, we can use the `addAll()` method. For example,

```
import java.util.LinkedHashSet;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> evenNumbers = new LinkedHashSet<>();
        evenNumbers.add(2);
        evenNumbers.add(4);
        System.out.println("LinkedHashSet1: " + evenNumbers);

        LinkedHashSet<Integer> numbers = new LinkedHashSet<>();
        numbers.add(1);
        numbers.add(3);
        System.out.println("LinkedHashSet2: " + numbers);

        // Union of two set
        numbers.addAll(evenNumbers);
        System.out.println("Union is: " + numbers);
    }
}
```

Output

```
LinkedHashSet1: [2, 4]
LinkedHashSet2: [1, 3]
Union is: [1, 3, 2, 4]
```

Intersection of Sets

To perform the intersection between two sets, we can use the `retainAll()` method. For example

```
import java.util.LinkedHashSet;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> primeNumbers = new LinkedHashSet<>();
        primeNumbers.add(2);
        primeNumbers.add(3);
        System.out.println("LinkedHashSet1: " + primeNumbers);

        LinkedHashSet<Integer> evenNumbers = new LinkedHashSet<>();
        evenNumbers.add(2);
        evenNumbers.add(4);
        System.out.println("LinkedHashSet2: " + evenNumbers);

        // Intersection of two sets
        evenNumbers.retainAll(primeNumbers);
        System.out.println("Intersection is: " + evenNumbers);
    }
}
```

Output

```
LinkedHashSet1: [2, 3]
LinkedHashSet2: [2, 4]
Intersection is: [2]
```

Difference of Sets

To calculate the difference between the two sets, we can use the `removeAll()` method. For example,

```
import java.util.LinkedHashSet;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> primeNumbers = new LinkedHashSet<>();
        primeNumbers.add(2);
        primeNumbers.add(3);
        primeNumbers.add(5);
        System.out.println("LinkedHashSet1: " + primeNumbers);

        LinkedHashSet<Integer> oddNumbers = new LinkedHashSet<>();
        oddNumbers.add(1);
        oddNumbers.add(3);
        oddNumbers.add(5);
        System.out.println("LinkedHashSet2: " + oddNumbers);

        // Difference between LinkedHashSet1 and LinkedHashSet2
        primeNumbers.removeAll(oddNumbers);
        System.out.println("Difference : " + primeNumbers);
    }
}
```

Output

```
LinkedHashSet1: [2, 3, 5]
LinkedHashSet2: [1, 3, 5]
Difference: [2]
```

Subset

To check if a set is a subset of another set or not, we can use the `containsAll()` method. For example,

```
import java.util.LinkedHashSet;

class Main {
    public static void main(String[] args) {
        LinkedHashSet<Integer> numbers = new LinkedHashSet<>();
        numbers.add(1);
        numbers.add(2);
        numbers.add(3);
        numbers.add(4);
        System.out.println("LinkedHashSet1: " + numbers);

        LinkedHashSet<Integer> primeNumbers = new LinkedHashSet<>();
        primeNumbers.add(2);
        primeNumbers.add(3);
        System.out.println("LinkedHashSet2: " + primeNumbers);

        // Check if primeNumbers is a subset of numbers
        boolean result = numbers.containsAll(primeNumbers);
        System.out.println("Is LinkedHashSet2 is subset of LinkedHashSet1? " + result);
    }
}
```

Output

```
LinkedHashSet1: [1, 2, 3, 4]
LinkedHashSet2: [2, 3]
Is LinkedHashSet2 is a subset of LinkedHashSet1? true
```

Other Methods Of LinkedHashSet

Method	Description
`clone()`	Creates a copy of the `LinkedHashSet`
`contains()`	Searches the `LinkedHashSet` for the specified element and returns a boolean result
`isEmpty()`	Checks if the `LinkedHashSet` is empty
`size()`	Returns the size of the `LinkedHashSet`
`clear()`	Removes all the elements from the `LinkedHashSet`

To learn more about `LinkedHashSet` methods, visit Java LinkedHashSet (official Java documentation).

LinkedHashSet Vs. HashSet

Both `LinkedHashSet` and `HashSet` implements the `Set` interface. However, there exist some differences between them.

- `LinkedHashSet` maintains a linked list internally. Due to this, it maintains the insertion order of its elements.
- The `LinkedHashSet` class requires more storage than `HashSet`. This is because `LinkedHashSet` maintains linked lists internally.
- The performance of `LinkedHashSet` is slower than `HashSet`. It is because of linked lists present in `LinkedHashSet`.

LinkedHashSet Vs. TreeSet

Here are the major differences between `LinkedHashSet` and `TreeSet`:

- The `TreeSet` class implements the `SortedSet` interface. That's why elements in a tree set are sorted. However, the `LinkedHashSet` class only maintains the insertion order of its elements.
- A `TreeSet` is usually slower than a `LinkedHashSet`. It is because whenever an element is added to a `TreeSet`, it has to perform the sorting operation.
- `LinkedHashSet` allows the insertion of null values. However, we cannot insert a null value to `TreeSet`.