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Experiment No - 04

AIM: TO IMPLEMENT VECTORS

THEORY:

- Vector is a data structure that is used to store a collection of elements. Elements can be of all primitive types like int, float, Object etc. Vectors are dynamic in nature and accordingly grow or shrink as per the requirement.
- Vector class is found in the java.util package.
- Vector class is a child class of the AbstractList class and implements the List interface. Therefore we can use all the methods of the List interface.
- Vectors are known to give ConcurrentModificationException when accessed concurrently at the time of modification.
- When a Vector is created, it has a certain capacity to store elements that can be defined initially. This capacity is dynamic in nature and can be increased or decreased.
- By definition, Vectors are synchronized, which implies that at a time, only one thread is able to access the code while other threads have to wait. Due to this, Vectors are slower in performance as they acquire a lock on a thread.

Declaration of Vector in Java

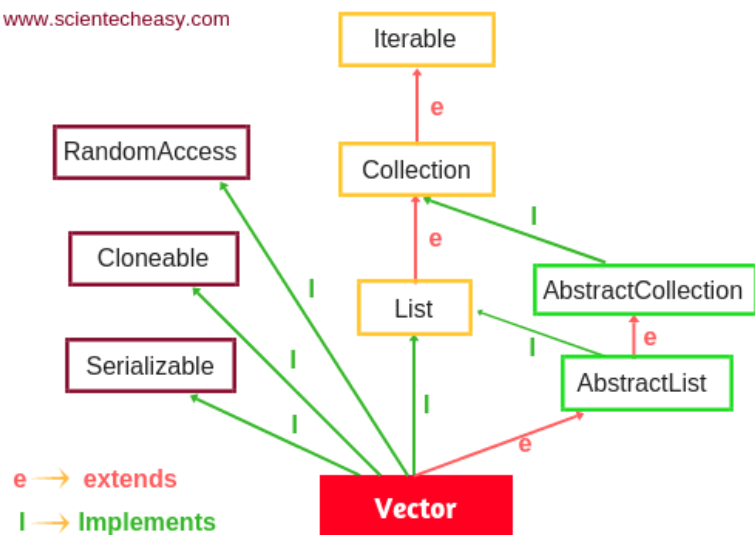
Syntax:

```
public class Vector<E> extends AbstractList<E> implements List<E>,
RandomAccess, Cloneable, Serializable
```

Here, E denotes the Element Type

Vector Class extends AbstractList and implements multiple interfaces like Serializable, Cloneable, Iterable<E>, Collection<E>, List<E>, RandomAccess interfaces.

www.scientecheasy.com



Hierarchy diagram of Vector



PROGRAM 1: Write A Program that accepts a shopping list of items and performs the following operations: Add an item at a specified location, delete an item in the list, and print the contents of the vector

CODE:

J Code1_ShoppingListVector.java X

```
Exp4 > J Code1_ShoppingListVector.java > Code1_ShoppingListVector > main(String[])
1  package Exp4;
2
3  import java.util.Scanner;
4  import java.util.Vector;
5
6  public class Code1_ShoppingListVector {
    Run | Debug
7      public static void main(String[] args) {
8          System.out.println(x: "Perna Sunil Jadhav - 60004220127");
9
10         Scanner sc = new Scanner(System.in);
11         System.out.println(x: "Enter the No. of Item \n(you can extend it later as it is in Vector: ");
12         int initialSize = sc.nextInt();
13         // creating a vector of given Capacity = 20 and Increment=10
14         // Here vector capacity will increase by 10 when needed
15         Vector<String> shoppingList = new Vector<String>(initialSize, capacityIncrement: 10);
16         for(int i = 0; i<initialSize; i++){
17             System.out.print("Enter Item "+(i+1)+" : ");
18             String item = sc.next();
19             shoppingList.add(item);
20         }
21         int ch = 0;
22         while(ch!=4){
23             System.out.print(s: "Menu\n1.Add a new item\n2.Delete an item\n3.Show List\n4.Exit\nEnter
your choice: ");
24             ch = sc.nextInt();
25
26             switch(ch){
27                 case 1:
28                     System.out.print(s: "Enter the element to be added: ");
29                     String item = sc.next();
30                     System.out.print(s: "Enter the position at which it needs to added: ");
31                     int index = sc.nextInt();
32                     shoppingList.add(index-1, item);
33                     System.out.println(item+" added Successfully!! --> "+shoppingList.toString());
34                     break;
35                 case 2:
36                     System.out.print(s: "Enter the element to be removed: ");
37                     String remove_item = sc.next();
38                     shoppingList.remove(remove_item);
39                     System.out.println(remove_item+" removed Successfully!! --> "+shoppingList.toString
());
40                     break;
41                 case 3:
42                     System.out.println(shoppingList.toString());
43                     break;
```



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```
44         case 4:
45             System.exit(status: 0);
46         default:
47             System.out.println(x: "Invalid choice");
48     }
49 }
50 sc.close();
51 }
52 }
```

OUTPUT:

```
Prerna Sunil Jadhav - 60004220127
Enter the No. of Item
(you can extend it later as it is in Vector:
3
Enter Item 1 : Top
Enter Item 2 : Jeans
Enter Item 3 : Kurta
Menu
1.Add a new item
2.Delete an item
3.Show List
4.Exit
Enter your choice: 1
Enter the element to be added: Jacket
Enter the position at which it needs to added: 2
Jacket added Successfully!! --> [Top, Jacket, Jeans, Kurta]
Menu
1.Add a new item
2.Delete an item
3.Show List
4.Exit
Enter your choice: 2
Enter the element to be removed: Top
Top removed Successfully!! --> [Jacket, Jeans, Kurta]
Menu
1.Add a new item
2.Delete an item
3.Show List
4.Exit
Enter your choice: 3
[Jacket, Jeans, Kurta]
Menu
1.Add a new item
2.Delete an item
3.Show List
4.Exit
```



PROGRAM2: Write a java program to find frequency of an element in the given Vector array.

CODE:

```
J Code2_FrequencyOfElement.java X
Exp4 > J Code2_FrequencyOfElement.java > Code2_FrequencyOfElement > main(String[])
1 package Exp4;
2 import java.util.*;
3 public class Code2_FrequencyOfElement {
4     public static void main(String[] args) {
5         System.out.println(x: "Prerna Sunil Jadhav - 60004220127");
6         Vector<Integer> v = new Vector<>();
7         v.add(e: 23);
8         v.add(e: 89);
9         v.add(e: 23);
10        v.add(e: 45);
11        v.add(e: 23);
12        v.add(e: 89);
13        System.out.println("Vector: "+v.toString());
14        Map<Integer, Integer> mp = new HashMap<>();
15        for (int i = 0; i < v.size(); i++){ // Traverse through array elements and count frequencies{
16            if (mp.containsKey(v.get(i))){
17                mp.put(v.get(i), mp.get(v.get(i)) + 1);
18            }
19            else{
20                mp.put(v.get(i), value: 1);
21            }
22        }
23        for (Map.Entry<Integer, Integer> entry : mp.entrySet()){ // Traverse through map and print frequencies
24            System.out.println(entry.getKey() + " occurs " + entry.getValue()+" times ");
25        }
26    }
27 }
```

OUTPUT:

```
Prerna Sunil Jadhav - 60004220127
Vector: [23, 89, 23, 45, 23, 89]
23 occurs 3 times
89 occurs 2 times
45 occurs 1 times
```

CONCLUSION:

- ✚ The usage of vectors in java is mainly in cases when we want the processes in a synchronized manner since ArrayList and Vector both possess the property of dynamic sizes, but ArrayList is avoided when working with multiple threads.
- ✚ Vector class in Java throws ConcurrentModificationException, IllegalArgumentException and NullPointerException exceptions.
- ✚ Vectors in Java can be initialized using four types of constructors.
- ✚ Various methods are provided in the Vector class for handling the vector operations.
- ✚ We can use vectors to implement Tree Data structure or anywhere we are unsure about the size.