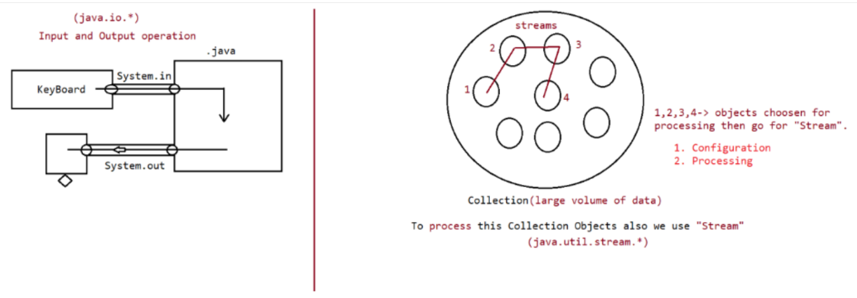
Stream API

23rd dec Stream API

24 December 2022 23:17



1,2,3,4-> objects choosen for processing then go for "Stream".

To process this Collection Objects also we use "Stream"

Stream API
=========

Stream ----->Channel through which there is a free flow movement of data.

Streams

To process objects of the collection, in 1.8 version Streams concept introduced.

What is the differences between Java.util.streams and Java.io streams?

java.util streams meant for processing objects from the collection. Ie, it represents a stream of objects from the collection but Java.io streams meant for processing binary and character data with respect to file.

i.e it represents stream of binary data or character data from the file .

hence Java.io streams and Java.util streams both are different.

What is the difference between collection and stream?

=> If we want to represent a group of individual objects as a single entity then We should go for collection.

=> If we want to process a group of objects from the collection then we should go for streams.

=> We can create a stream object to the collection by using stream() method of Collection interface. stream() method is a default method added to the Collection in 1.8 version.

```
public class Test {
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(0);
        al.add(5);
        al.add(10);
        al.add(15);
        al.add(20);
        al.add(25);
        System.out.println(al);// [0,5,10,15,20,25]
        // till jdk1.7v
        ArrayList<Integer> evenList = new ArrayList<Integer>();
        for (Integer i1 : al)
            if (i1 % 2 == 0)
                evenList.add(i1);
        System.out.println(evenList);// [0,10,20]

        // From JDK1.8V we use Streams
        // 1. Configuration ===> al.stream()
        // 2. Processing ===> filter(i->i%2==0).collect(Collectors.toList())

        List<Integer> streamList = al.stream().filter(i -> i % 2 == 0).collect(Collectors.toList());
        System.out.println(streamList); // [0,10,20]
        streamList.forEach(System.out::println);  0
                                                   10
    }                                              20
}
```

eg#2. map() :

```
import java.util.*;
import java.util.stream.*;
import java.util.*;
import java.util.stream.*;
public class Test {
```

```java
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(0);
        al.add(5);
        al.add(10);
        al.add(15);
        al.add(20);
        al.add(25);
        System.out.println(al);
        // till JDK1.7V
        ArrayList<Integer> doubleList = new ArrayList<Integer>();
        for (Integer i1 : al)
            doubleList.add(i1 * 2);
        System.out.println(doubleList);
        // from JDK1.8V
        // map-> for every object, if a new object has to be created thengo for Map

        List<Integer> streamList = al.stream().map(obj -> obj * 2).collect(Collectors.toList());
        System.out.println(streamList);
        streamList.forEach(i -> System.out.println(i));

        System.out.println();
        streamList.forEach(System.out::println);
    }
}
```

=> Stream is an interface present in java.util.stream. Once we got the stream, by using that we can process objects of that collection.

We can process the objects in the following 2 phases

1.Configuration

2.Processing

1) Configuration:

We can configure either by using filter mechanism or by using map mechanism.

Filtering:

We can configure a filter to filter elements from the collection based on some boolean condition by using filter()method of Stream interface.

public Stream filter(Predicate<T> t) here (Predicate<T > t) can be a boolean valued function/lambda expression

Ex:

Stream s = c.stream();

Stream s1 = s.filter(i -> i%2==0);

Hence to filter elements of collection based on some Boolean condition we should gofor filter() method.

Mapping:

If we want to create a separate new object, for every object present in the collection based on our requirement then we should go for map() method of Stream interface.

public Stream map (Function f);

It can be lambda expression also

Ex:

Stream s = c.stream();

Stream s1 = s.map(i-> i+10);

Once we performed configuration we can process objects by using several methods.

2) Processing

processing by collect() method
Processing by count()method
Processing by sorted()method
Processing by min() and max() methods
forEach() method
toArray() method
Stream.of()method

eg#1.

```
import java.util.*;
import java.util.stream.*;
public class Test {
    public static void main(String[] args) {
        ArrayList<String> names = new ArrayList<String>();
        names.add("sachin");
        names.add("saurav");
        names.add("dhoni");
        names.add("dravid");
        names.add("kohli");
        names.add("raina");
        System.out.println(names);                                              // cost ↑ (processing time ↑)
        List<String> reslut = names.stream().filter(name -> name.length() > 5).collect(Collectors.toList());
        System.out.println(reslut.size()); // 3

        long count = names.stream().filter(name -> name.length() > 5).count();
        System.out.println("The no of objects whose string length > 5 is ::" + count);//3
    }
}

import java.util.*;
import java.util.stream.*;
//Comparable(Predefined API for natural sorting order) -> compareTo(Object obj)
//Comparator(for userdefined class for customized sorting order)->
compare(Obj1,Obj2)
public class Test {
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(10);
        al.add(0);
        al.add(15);
        al.add(5);
        al.add(20);
        System.out.println("Before sorting :: " + al);
        // using stream api
        List<Integer> resultList = al.stream().sorted().collect(Collectors.toList());
        System.out.println("After sorting :: " + resultList);// 0 5 10 15 20
        List<Integer> customizedResult = al.stream().sorted((i1, i2) -> i2.compareTo(i1)).collect(Collectors.toList());
        System.out.println("After sorting :: " + customizedResult); // 20 15 10 5 0
    }
}

import java.util.*;
import java.util.stream.*;
//Comparable(Predefined API for natural sorting order) -> compareTo(Object obj)
//Comparator(for userdefined class for customized sorting order)-> compare(Obj1,Obj2)
public class Test {
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(10);
        al.add(0);
        al.add(15);
        al.add(5);
        al.add(20);
        System.out.println("Array List is ::" + al);
        Object[] objArr = al.stream().toArray();
        for (Object obj : objArr)
            System.out.println(obj);
        System.out.println();
        Integer[] objArr1 = al.stream().toArray(Integer[]::new);
        for (Integer obj1 : objArr1)
            System.out.println(obj1);
    }
}
```

10
0
15
5
20

eg

```
import java.util.*;
import java.util.stream.*;
public class Test {
    public static void main(String[] args) {
        // Stream API ===> Collections(group of objects)
        Stream s = Stream.of(9, 99, 999, 9999, 99999);
        s.forEach(System.out::println); //
        System.out.println();
        Double[] d = { 10.0, 10.1, 10.2, 10.3, 10.4 };
        Stream s1 = Stream.of(d);
        s1.forEach(System.out::println);
    }
}
```

collect()

=======

This method collects the elements from the stream and adding to the specified to the collection indicated (specified) by argument.

eg#1.

```
public class Test {
    public static void main(String[] args) {
        ArrayList<String> names = new ArrayList<String>();
        names.add("sachin");
        names.add("saurav");
        names.add("dhoni");
        names.add("yuvi");
        System.out.println(names);// [sachin,saurav,dhoni,yuvi]
        // Predicate(I)
        // public abstract boolean test(T);
        List<String> result = names.stream().filter(name -> name.length() > 5).collect(Collectors.toList());
        System.out.println(result);
        // Function(I)<T,R>
        // public abstract R apply(T);
        List<String> mapResult = names.stream().map(name -> name.toUpperCase()).collect(Collectors.toList());
        System.out.println(mapResult);
    }
}
```

count()

======

This method returns number of elements present in the stream.

public long count()

```
public class Test {
    public static void main(String[] args) {
        ArrayList<String> names = new ArrayList<String>();
        names.add("sachin");
        names.add("saurav");
        names.add("dhoni");
        names.add("yuvi");
        System.out.println(names);// [sachin,saurav,dhoni,yuvi]
        long count = names.stream().filter(name -> name.length() > 5).count();
        System.out.println(count);//2
    }
}
```

III.Processing by sorted()method

If we sort the elements present inside stream then we should go for sorted() method.

The sorting can either default natural sorting order or customized sorting order specified by comparator.

sorted()- default natural sorting order

sorted(Comparator c)-customized sorting order.

```
public class Test {
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(10);
        al.add(20);
        al.add(0);
        al.add(5);
        al.add(25);
        al.add(15);
        System.out.println(al);
        List<Integer> result = al.stream().sorted().collect(Collectors.toList());
        System.out.println(result);
        List<Integer> customizedResult = al.stream().sorted((i1, i2) ->-i1.compareTo(i2)).collect(Collectors.toList());
        System.out.println(customizedResult);
    }
}
```

IV.Processing by min() and max() methods

min(Comparator c) returns minimum value according to specified comparator.

max(Comparator c) returns maximum value according to specified comparator.

```
public class Test {
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(10);
        al.add(20);
        al.add(0);
        al.add(5);
        al.add(25);
        al.add(15);
        System.out.println(al);
        Integer minValue = al.stream().min((i1, i2) -> i1.compareTo(i2)).get();
        System.out.println(minValue);
        Integer maxValue = al.stream().max((i1, i2) -> i1.compareTo(i2)).get();
        System.out.println(maxValue);
    }
}
```

V.forEach() method

This method will not return anything.

This method will take lambda expression as argument and apply that lambda expression for each element present in the stream.

```
public class Test {
    public static void main(String[] args) {
        ArrayList<String> names = new ArrayList<String>();
        names.add("AAA");
        names.add("BBB");
        names.add("CCC");
        names.add("DDD");
        names.stream().forEach(name -> System.out.println(name));
        names.stream().forEach(System.out::println);
    }
}
```

VI.toArray() method

We can use toArray() method to copy elements present in the stream into specified array

```
import java.util.*;
import java.util.stream.*;
public class Test {
    public static void main(String[] args) {
        ArrayList<Integer> al = new ArrayList<Integer>();
        al.add(0);
        al.add(10);
        al.add(5);
        al.add(20);
        al.add(15);
        System.out.println(al);
        Integer[] array = al.stream().toArray(Integer[]::new);
        for (Integer element : array)
            System.out.println(element);
    }
}
```

VII.Stream.of()method

We can also apply a stream for group of values and for arrays.

Ex:

```
Stream s=Stream.of(99,999,9999,99999);
s.forEach(System.out:: println);
Double[] d={10.0,10.1,10.2,10.3};
Stream s1=Stream.of(d);
s1.forEach(System.out :: println);
```