Object Oriented Analysis and Design with Java

UE19CS353

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Generic Programming

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Generic Programming

- Generics means parameterized types
- Enables to create classes, interfaces, and methods
- The data upon which they operate is specified as a parameter.
- Generic programming refers to writing code that will work for any data irrespective of their data type.
- Example: ArrayList is just one class, but the source code works for many different types. This is generic programming.
- An entity such as classes / interfaces / methods that works for any data types is known as generic entity
- By using generics, we can implement algorithms that work on different types of objects and at the same time, they are type safe too.

Generic Classes

Generic classes **encapsulate operations that are not specific to a particular data type**.
The most common use for generic classes is with collections like linked lists, hash tables, stacks, queues, trees, and so on.

To create an instance of generic

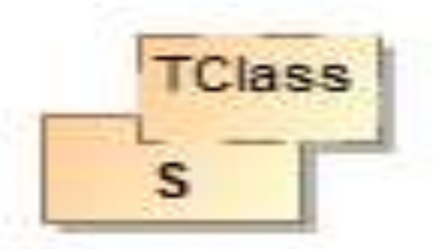
```
BaseType <Type> obj = new BaseType <Type>()
```

- <> to used to specify parameter types in generic class creation
- In Parameter type we can not use primitives like 'int','char' or 'double'.

UML representation of Generic Class, Interface and Method

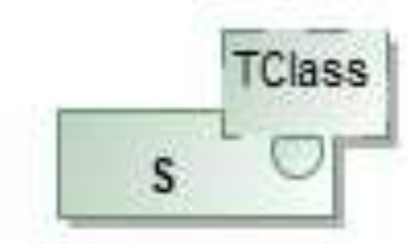
Generic Class

```
public class S<T>
{
}
```



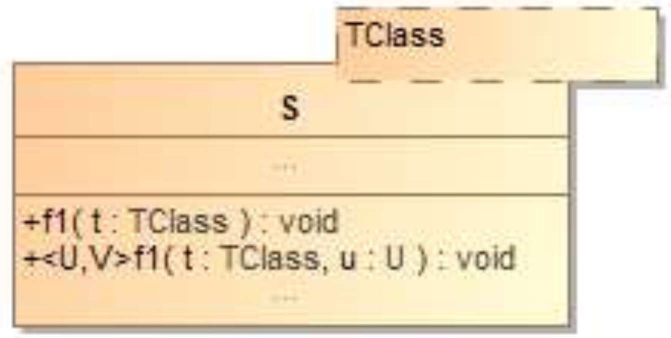
Generic Interface

```
interface S<T>
{
}
```



Generic Method

```
class b
{
 public T f1<T, U>(T t, U u)
       where U:T {return t;}
}
```



Generic Class implementation using Java

```
class Test<T>
{
      T obj;
      Test(T obj) { this.obj = obj; }
      public T getObject() { return this.obj; }
}

class Main
{
      public static void main (String[] args)
      {
            Test <Integer> iObj = new Test<Integer>(15);
            System.out.println(iObj.getObject());
            Test <String> sObj = new Test<String>(“OOADJ”);
            System.out.println(sObj.getObject());
      }
}
```

Generic Functions

Generic functions are called with different types of arguments based on the type of arguments passed to the generic method

```
class Test {
     static <T> void genericDisplay (T element){
          System.out.println ( element.getClass().
               getName()+" = " + element);
     }
     public static void main(String[] args){
          genericDisplay(11);
          genericDisplay(“OOADJ");
          genericDisplay(1.0);
     }
}
```

Concepts of Generic Programming

- Generics work only with Reference Types

- Generic types differ based on their type arguments

```
class Test<T> {
        T obj;
        Test(T obj) { this.obj = obj; } // constructor
        public T getObject() { return this.obj;
}
class Main {
        public static void main (String[] args) {
                Test <Integer> iObj = new Test<Integer>(15);
                System.out.println(iObj.getObject());

                Test <String> sObj = new Test<String>(“OOADJ");
                System.out.println(sObj.getObject());
                iObj = sObj; //This results in an error
        }
}
```

Advantages of Generics:

- Code Reuse
- Type Safety
- Individual Type Casting is not needed

Individual Type Casting:
When using generics, during compile time we can identify the data of collection is of same type or not; thus can avoid typecasting of individual elements of the collection

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THANK YOU

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