Java Annotations

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Java **Annotation** is a tag that represents the *metadata* i.e. attached with class, interface, methods or fields to indicate some additional information which can be used by java compiler and JVM.

Annotations in Java are used to provide additional information, so it is an alternative option for XML and Java marker interfaces.

First, we will learn some built-in annotations then we will move on creating and using custom annotations.

Built-In Java Annotations

There are several built-in annotations in Java. Some annotations are applied to Java code and some to other annotations.

Built-In Java Annotations used in Java code

- @Override
- @SuppressWarnings
- @Deprecated

Built-In Java Annotations used in other annotations

- @Target
- @Retention
- @Inherited
- @Documented

Understanding Built-In Annotations

Let's understand the built-in annotations first.

@Override

@Override annotation assures that the subclass method is overriding the parent class method. If it is not so, compile time error occurs.

Sometimes, we does the silly mistake such as spelling mistakes etc. So, it is better to mark @Override annotation that provides assurity that method is overridden.

```
1. class Animal{
2. void eatSomething(){System.out.println("eating something");}
3. }
4.
5. class Dog extends Animal{
6. @Override
7. void eatsomething(){System.out.println("eating foods");}//should be eatSomething
8. }
9.
10. class TestAnnotation1{
11. public static void main(String args[]){
12. Animal a=new Dog();
13. a.eatSomething();
14. }}
```

Test it Now

```
Output:Comple Time Error
```

@SuppressWarnings

@SuppressWarnings annotation: is used to suppress warnings issued by the compiler.

```
1. import java.util.*;
2. class TestAnnotation2{
3. @SuppressWarnings("unchecked")
4. public static void main(String args[]){
5. ArrayList list=new ArrayList();
6. list.add("sonoo");
7. list.add("vimal");
8. list.add("ratan");
9.
10. for(Object obj:list)
11. System.out.println(obj);
12.
13. }}
```

Test it Now

```
Now no warning at compile time.
```

If you remove the @SuppressWarnings("unchecked") annotation, it will show warning at compile time because we are using non-generic collection.

@Deprecated

@Deprecated annoation marks that this method is deprecated so compiler prints warning. It informs user that it may be removed in the future versions. So, it is better not to use such methods.

```
1. class A{
2. void m(){System.out.println("hello m");}
3.
4. @Deprecated
5. void n(){System.out.println("hello n");}
6. }
7.
8. class TestAnnotation3{
9. public static void main(String args[]){
10.
11. A a=new A();
12. a.n();
13. }}
```

Test it Now

At Compile Time:

```
Note: Test.java uses or overrides a deprecated API.

Note: Recompile with -Xlint:deprecation for details.
```

At Runtime:

```
hello n
```

Java Custom Annotations

Java Custom annotations or Java User-defined annotations are easy to create and use.
The *@interface* element is used to declare an annotation. For example:

```
1. @interface MyAnnotation{}
```

Here, MyAnnotation is the custom annotation name.

Points to remember for java custom annotation signature

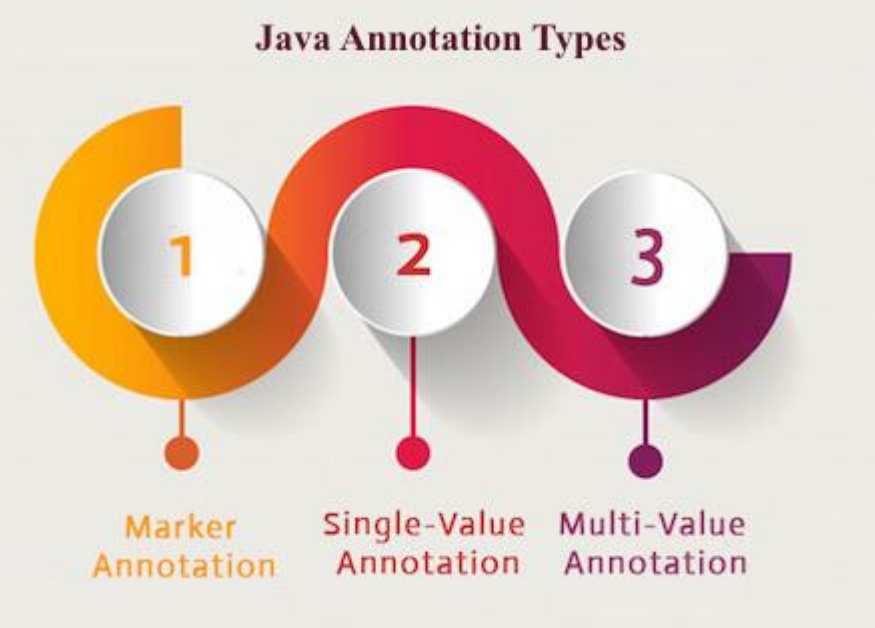
There are few points that should be remembered by the programmer.

1. Method should not have any throws clauses
2. Method should return one of the following: primitive data types, String, Class, enum or array of these data types.
3. Method should not have any parameter.
4. We should attach @ just before interface keyword to define annotation.
5. It may assign a default value to the method.

Types of Annotation

There are three types of annotations.

1. Marker Annotation
2. Single-Value Annotation
3. Multi-Value Annotation



1) Marker Annotation

An annotation that has no method, is called marker annotation. For example:

```
1. @interface MyAnnotation{}
```

The @Override and @Deprecated are marker annotations.

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2) Single-Value Annotation

An annotation that has one method, is called single-value annotation. For example:

```
1. @interface MyAnnotation{
2. int value();
3. }
```

We can provide the default value also. For example:

```
1. @interface MyAnnotation{
2. int value() default 0;
3. }
```

How to apply Single-Value Annotation

Let's see the code to apply the single value annotation.

```
1. @MyAnnotation(value=10)
```

The value can be anything.

---

3) Multi-Value Annotation

An annotation that has more than one method, is called Multi-Value annotation. For example:

```
1. @interface MyAnnotation{
2. int value1();
3. String value2();
4. String value3();
5. }
6. }
```

We can provide the default value also. For example:

```
1. @interface MyAnnotation{
2. int value1() default 1;
3. String value2() default "";
4. String value3() default "xyz";
```

```
5. }
```

How to apply Multi-Value Annotation

Let's see the code to apply the multi-value annotation.

```
1. @MyAnnotation(value1=10,value2="Arun Kumar",value3="Ghaziabad")
```

Built-in Annotations used in custom annotations in java

- @Target
- @Retention
- @Inherited
- @Documented

@Target

@Target tag is used to specify at which type, the annotation is used.

The java.lang.annotation.**ElementType** enum declares many constants to specify the type of element where annotation is to be applied such as TYPE, METHOD, FIELD etc. Let's see the constants of ElementType enum:

Element Types	Where the annotation can be applied
TYPE	class, interface or enumeration
FIELD	fields
METHOD	methods
CONSTRUCTOR	constructors
LOCAL_VARIABLE	local variables

ANNOTATION_TYPE	annotation type
PARAMETER	parameter

Example to specify annoation for a class

```
1. @Target(ElementType.TYPE)
2. @interface MyAnnotation{
3. int value1();
4. String value2();
5. }
```

Example to specify annotation for a class, methods or fields

```
1. @Target({ElementType.TYPE, ElementType.FIELD, ElementType.METHOD})
2. @interface MyAnnotation{
3. int value1();
4. String value2();
5. }
```

@Retention

@Retention annotation is used to specify to what level annotation will be available.

RetentionPolicy	Availability
RetentionPolicy.SOURCE	refers to the source code, discarded during compilation. It will not be available in the compiled class.
RetentionPolicy.CLASS	refers to the .class file, available to java compiler but not to JVM . It is included in the class file.
RetentionPolicy.RUNTIME	refers to the runtime, available to java compiler and JVM .

Example to specify the RetentionPolicy

```
1. @Retention(RetentionPolicy.RUNTIME)
2. @Target(ElementType.TYPE)
```

```
3. @interface MyAnnotation{
4. int value1();
5. String value2();
6. }
```

Example of custom annotation: creating, applying and accessing annotation

Let's see the simple example of creating, applying and accessing annotation.

File: Test.java

```
1. //Creating annotation
2. import java.lang.annotation.*;
3. import java.lang.reflect.*;
4.
5. @Retention(RetentionPolicy.RUNTIME)
6. @Target(ElementType.METHOD)
7. @interface MyAnnotation{
8. int value();
9. }
10.
11. //Applying annotation
12. class Hello{
13. @MyAnnotation(value=10)
14. public void sayHello(){System.out.println("hello annotation");}
15. }
16.
17. //Accessing annotation
18. class TestCustomAnnotation1{
19. public static void main(String args[])throws Exception{
20.
21. Hello h=new Hello();
22. Method m=h.getClass().getMethod("sayHello");
23.
24. MyAnnotation manno=m.getAnnotation(MyAnnotation.class);
25. System.out.println("value is: "+manno.value());
26. }}
```

Test it Now

```
Output:value is: 10
```

download this example

How built-in annotaions are used in real scenario?

In real scenario, java programmer only need to apply annotation. He/She doesn't need to create and access annotation. Creating and Accessing annotation is performed by the implementation provider. On behalf of the annotation, java compiler or JVM performs some additional operations.

@Inherited

By default, annotations are not inherited to subclasses. The @Inherited annotation marks the annotation to be inherited to subclasses.

```
1. @Inherited
2. @interface ForEveryone { }//Now it will be available to subclass also
3.
4. @interface ForEveryone { }
5. class Superclass{}
6.
7. class Subclass extends Superclass{}
```

@Documented

The @Documented Marks the annotation for inclusion in the documentation.