

Accessors

private	class private
(default)	package private
protected	package private+subclass
public	any class

Optional specifier

static	class method, accessed by class name or obj reference
abstract	w/o body, even empty {}
final	no overridden by subclass
synchronized	OCP, thread safe
native	interact with other language
strictfp	float point calc portable

Return type

Required	void =return; or no return statement
void method(){return;}	void method(){}
String method(){return "";}	String method(){return null;}
String[] method(){return null;}	Integer method(){return null;}
void method(){return null;}	This not compiled
String method(){if ... return null; else return;}	Not compile

Method name

follow variable naming rule
start with letters, &, _
can contains number
Can not start with number

Parameter list

Must have a parameter list
if no parameter, use empty ()
parameter separated by ;

Optional Exception List

throws exception_name1, exception_name-2, ...

Method body

MUST for all non abstract method, Could by empty {}
abstract method could not have a body, even empty {} one

Order must be followed

accessor --optional-modifier -- return type name() optional-throws {}
accessor could be omitted for default access
accessor, return type, name, (), {} are required
signature: return type + name + ()
overloading: same name, but differs in parameter list, overloading won't care about return type

varargs

```
//varargs=variable arguments,
//array but variable in length
//only last one parameter could be varargs
//accessed like array
public void walk (int start,
int...s teps)
{ System.out.println("step -
s.length +", " +steps [0]);}
```

varargs (cont)

```
> walk(1); //ArrayIndexOutOfBoundsException
walk(1,2) //1,2
walk(1,2,3); //2,2
walk(1,null); //NullPointerException
walk(1,new int[] {1,2,3}); //3,1
walk(1,new int[3]); //3,0
```

protected members

pacakage	subclass	direct access	by obj ref
same	Yes	yes	yes
same	No	yes	Yes
diff	Yes	yes	No *
diff	diff	No	No

could access protected member from parent by obj ref of subclass itself

Design static methods and fields

2 use cases

shared component among instances util/helper which not require any obj state

2 calling approaches

by class name by obj ref (null obj can too)

Static variables Counter, Constant

Static initializer-run once static {...} //bad practice

import static java.util.Arrays.asList

import static java.util.Arrays.*;

static import syntax error
java.util.Arrays.*;

import static Can not static import
java.util.Arrays; class

Design static methods and fields (cont)

Name conflicts: not compiled
Solution: regular import, ref by classname

Object has its status, but shared the code, and static data

Static vs instance

type	calling	legal	how
static method	static	Yes	Class name
static method	instance	No	create obj
instancd method	static	Yes	class name,obj ref
instance method	instance	Yes	obj ref

Object has its status, but shared the code, and static data

Passing data among method

pass by value change in callee not affect caller

pass by ref change in callee do affect caller

Return value, if not used, will be discarded.

Overloading a method

Method signature name+parameter list

Overloading: same name+different parameters

varargs 2nd test can't compile, varargs and array = same parameter list

Overloading a method (cont)

void test(int... a){}; void test(int[] a){}

test(new {1,2,3}) call either test(1,2,3) call test(int... a) only

autoboxing void fly(int a){}; void fly(Integer a){};

fly(3) call fly(int a); if not exit, call fly(Integer a)

Ref type void fly(Object o){};

fly(3):match fly(int) >fly(Integer) >fly(Object o)

Primitive autocast(wider), explicitly cast(narrower)

overloading matching order

exact match -> unwrapping -> promotion -> wrapping -> varargs(exact match, promotion, wrapper)

promotion is an independent check, it retains no influence over wrapping check

void play(Long l){}

play(4); compile error, 2 step conversion, only 1 conversion allowed, play(4L) will work.

Create constructors

Same name as class no return type

default no-argument constructor auto generated if no constructor provided

overloading of constructor Constructor chain by this(...)

Create constructors (cont)

Calling This(...): not in first line of static method method

Constructor new Construct- or(...) Create new object

final field must be initialized by the time of constructor completion

super() call automatically in any constructor implicitly
all class are subclass of Object

order of initialization super() is always call in every constructor implicitly; super(...) must be called explicitly

super() ->static declaration and static {} as its order ->instance declaration and {} as its order ->constructor

example

class public bunny(){ } wrong

public Bunny(){ } OK

public void bunny(){ } OK

public void Bunny(){ } wrong



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Encapsulating data

Encapsulation: binding fields with method; data hiding(hiding properties+implementation details): private fields+public setter and getter; purpose: data validation and integrity + flexibility code for upgrade and maintenance

private attributes public getter(), setter(), isA()

Immutable class Math, String

Class w/o public setter no status change of object once created

safe to passing around and easy to maintain better performance by limiting the number of copies (string pool)

String and StringBuffer Mutated by StringBuffer, return a String

JavaNean

a class with no-argument constructor naming convention:i-nstance variable, getA,s-etA,isA,

reusable easy to code

Lambdas expression

Why lambdas?

less code delayed implementation declarative

what's lambdas? a declarative block of code

passed to the associated 1 method interface, as delayed dynamic implement the method

Syntax

parameter -> body

Lambdas expression (cont)

()->>true simplest format

a->a.c-anHop() type is optional

(Animal a) -> {return a.canHop();} can't miss ; or return if use{}; need () if has type

(a,b)->a.canHop() () required if >1args; if >1 statement, need {}

Context functional method to match the only method of an interface

replace the implementing class of the interface

parameter type will be get from the associated interface API

Notes

lambdas expr could access static/instance variable. method parameter and local variable also fine if not assigned a new value

can not redeclare a variable same name as local variable

(a,b)->{int a=0;return 5;} won't compile

Lambdas example - Predicate

```
//Predicate interface
public interface Predicate < T>{
    boolean test(T t); }
//
class Animal{
    private String canHop;
    public void setCanHop (boolean b)
    { canHop =b; }
    public boolean canHop()
    { return canHop; }
}
public interface CheckTrait {
    boolean test(Animal a); }
public class CheckIfHopper implements CheckTrait{
    public boolean test(Animal a)
    { return a.canHop(); }
}
//compare
import java.util.function.Predicate;
public class TestLambdas {
    public static void main(String[] args){
        Animal a1 = new Animal();
        a1.setCanHop(true);
        print(a1,a->a.canHop());
        // print2 (new CheckIfHopper());
    }
    void print(Animal a, Predicate<Animal> p) {
        if (p.test(a) {} }
        void print2 (Animal a, CheckTrait c) {
            if (c.test(a) {} }
    }
}
```



Lambdas example - Predicate (cont)

> //for Predicate version, no interface and implementing class needed
// {return a.canHop();} will be delayed
dynamic implementation of test method in Predicate interface.

Type must match in lambda expr, or just do put type

Lambdas - ArrayList.removeIf()

```
//Java 8 intergrated Predicate  
interface into ArrayList  
default boolean removeIf( Predicate <? super E> filter)  
arrayL ist.re mov eIf (s- >s.c -  
ha rAt (0) !='h');
```

ArrayList<? super E> : super class of E,
upper bound: "This can be cast to E".
ArrayList<? extends E>: hold type=
subclass of E, lower bound: "E can be cast
to this."
ArrayList< E>: holder type E

What happens after new Constructor()

1. allocate memory space on the heap
2. create the object and instance variables are initialized with default value
3. explicit initialize the instance variabls
4. constructor code are executed

Notes:static variable are initialized once for all objects to be created, so it is before step 2

for no argument constructor, super() is called first for initialization

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