PROGRAMACIÓN ORIENTADA A OBJETOS

TEMA5: Herencia y UML2Java

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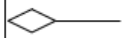
Antes que nada veamos W5H1
Para ver como funciona herencia.

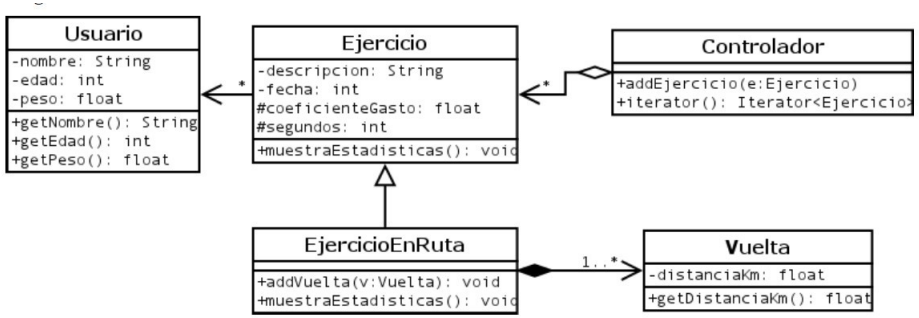
```
===[SLIDE #01]===[PUBLIC, FRIENDLY, PROTECTED AND PRIVATE]===========

| attribute     | Class |Package|Subclass|World |
+---------------+-------+-------+-------+-------+
| private       |   +   |   -   |   -   |   -   |
+---------------+-------+-------+-------+-------+
| no modifier   |   +   |   +   |   -   |   -   | (friendly)
+---------------+-------+-------+-------+-------+
| protected     |   +   |   +   |   +   |   -   |
+---------------+-------+-------+-------+-------+
| public        |   +   |   +   |   +   |   +   |
+---------------+-------+-------+-------+-------+

+ : accessible          - : not accessible

Friendly (or Package Private or just Package or Default) Can only be seen
and used by the package in which it was declared. This is the default in
Java (which some see as a mistake).

UML:    + public        # protected     ~ package       - private
```

```
===[SLIDE #02]===[UML CLASS]=============================================

+-----------------------------+
| NameClassA                  |  public class NameClassA {
+-----------------------------+
| + int attribA               |  public int attribA;
| # float attribB             |  protected float attribB;
| ~ boolean attribC           |  boolean attribC;
| - NameClassB attribD        |  private NameClassB attribD;
| + CONSTANT_NAME: int 0      |  public static final int CONSTANT_NAME = 0;
+-----------------------------+
| + nameMethodPublic(nomArgA: typeArgA): retTypeA
| - nameMethodPrivate(nomArgB: typeArgB): retTypeB
+-----------------------------+

        public retTypeA nameMethodPublic(typeArgA nomArgA) {
                ...
        }
        private retTypeB nameMethodPrivate(typeArgB nomArgB) {
                ...
        }
```

Tipus de relacions entre classes

Relació	Gràfic	Significat
Associació		Els objectes de la classe origen gestionen objectes de la classe destí.
Agregació		És una manera de definir directament una relació que s'anomenaria "conté" o "desa", on l'objecte contingut no és imprescindible dins el conjunt (exemple: un ànec a un llac, un llapis a una capsa).
Composició		Com la composició, però els objectes de la classe origen no tenen sentit sense cap objecte de la classe destí (exemple: les pàgines d'un llibre, els alumnes d'una classe)

Exemple de diagrama UML




```
===[SLIDE #03]===[Y LAS FLECHITAS...?]================================

A - - - puede lanzar - - -> B   A hace un thow de esa exception B
A - - - usa - - -> B    A usa metodos/atributos estaticos de B
                        o tiene metodos con atributos de tipo Class B
A - - - nombre de un atributo de A pero en plural - - -> B
        El atributo de A puede tomar valores que son constantes en B
A -------->B    (asociacion)
A <>------>B    (agregacion)
A <rombo relleno>--->B  (composicion) <*>--->
        Los tres se traducen en lo mismo. :-)
        -> Mira la cardinalidad!
        Lo cualo?

A 1 ------> 1 B
A 1 ------> * B
A * ------> * B
A * ------> 1 B
Si no aparece una cardinalidad es 1:
A ------> * B           es      A 1 ------> * B
A ------> B             es      A 1 ------> 1 B
```

```
===[SLIDE #04]===[MULTIPLICITY...?]===================================

El nombre de la relacion sera el nombre del attribute/Collection.

A 1     One only                A.attribute de tipo B
A 0..1  Zero or one             A.attribute que puede ser null o no
A 0..*  Zero or more            A.Collection de Bs
A *     Zero or more            A.Collection
A 1..*  One or more             A.Collection
A 3     Three only              A.Collection or A.ClassB[3] attributeName;
A 0..5  Zero to Five            A.Collection
A 5..15 Five to Fifteen         A.Collection

table from: http://www.ibm.com/developerworks/rational/library/content/
        RationalEdge/sep04/bell/

A 1 ... B 1             in classA attributeB
A * ... B 1             in classA attributeB
A 1 ... B *             in classA Collection of Bs
A * ... B *             in classA Collection of Bs      and
                        in classB Collection of As
```

```
===[SLIDE #05]===[WHICH COLLECTION ALGORITHM]=========================
If classA has a collection of Bs, which Collection for B should I use?
if (B has an attribute that is a unique identifier)
        // Map<K,V>
        if (want to be able to sort it by the comparator of K)
                TreeMap<K,V>
        else
                HashMap<K,V>
else if (B cannot have to elements that are equal &&
                we don't need to order them in a particular order)
        // Set<E>
        if (want to be able to sort it by the comparator of K)
                TreeSet<K,V>
        else
                HashSet<K,V>
else
        //List<E>
        if (want efficiency in adding/removing elements)
                LinkedList<E>
        else // want efficiency in accessing to a certain position?
                ArrayList<E>
```

```
===[SLIDE #06]===[COMPOSICION]=======================================

- COMPOSICION 1 A 1:
        Automovil <*>1---conte---1->Diposit
public class Automovil {
        private Diposit diposit;

- COMPOSICION 1 A N DONDE B _NO_TIENE ATRIBUTO IDENTIFICADOR:

        Benzinera <*>1---disposa de---1..*-> Sortidor
public class Benzinera {
        private Set<Sortidor> sortidors; // Tambe podria ser List

- COMPOSICION 1 A N DONDE B TIENE ATRIBUTO IDENTIFICADOR:

        Benzinera <*>1---disposa de---1..*-> Sortidor
                                                - identificador: int
public class Benzinera {
        private HashMap<Integer,Sortidor> sortidors;
public class Sortidor {
        private int identificador;
```

```
===[SLIDE #07]===[STATIC, REFLEXIVE ASSOCIATIONS AND QUALIFIERS]======

- Static classNames, attributes and methods are underlined.

- Reflexive associations: ClassA ----> ClassA
        +------+
        |ClassA|--+
        +------+  |
            ^     |
            +-----+

- Association Qualifier: (you could have reflexive qualified associations)
        +------+                      +------+
        |      +--------------+1      1|      +
        |ClassA|aAttrib: type|--------|ClassB|
        |      +--------------+        |      +
        +------+                      +------+
class ClassA {
        type aAttrib;
        Map<type,ClassB>;
        ...
```

```
===[SLIDE #08]===[MORE ON QUALIFIERS]================================

- The use of explicitly using an association qualifier ...
        +------+                      +------+
        |      +--------------+1      1|      +
        |ClassA|aAttrib: type|--------|ClassB|
        |      +--------------+        |      +
        +------+                      +------+

class ClassA {
        type aAttrib;
        Map<type,ClassB>; // Map<K,V>
        ...

... is needed when:
- K is not an attribut of V.
- The association is a reflexive one.
- When K is not a unique identifier of V.
```

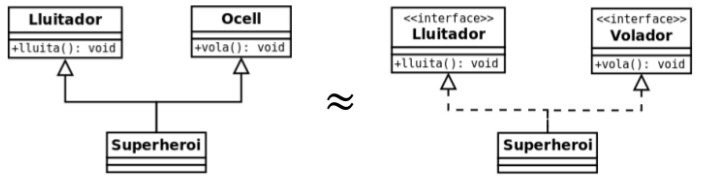
```
===[SLIDE #09]===[ABSTRACT CLASSES]=================================

+----------------------------+          +----------------------------+
| <<class>>                  |(extends) | <<abstract class>>         |
| NameClassA                 |--------|>| NameClassB                 |
+----------------------------+          +----------------------------+

public class NameClassA extends NameClassB { ...// lo veremos cuando
hagamos
public abstract Name ClassB { ...               // herencia y polimorfismo

A class with all attributes and methods static will be declared as abstract
even if it's not explicitly said in the UML.
```

```
===[SLIDE #10]===[INTERFACES]=======================================

+----------------------------+          +----------------------------+
| <<class>>                  |implements| <<interface>>              |
| NameClassA                 | - - - -|>| NameInterfaceB             |
+----------------------------+          +----------------------------+
                                        +----------------------------+
                                        |+methodA(...):retType       |
                                        |+methodB(...):retType       |
                                        +----------------------------+

public NameClassA implements NameInterfaceB { ...
interface NameInterfaceB { ...

We say: an interface has no state.
So it can only have methods, and constants.

Variables can be defined in interfaces, but they do not behave as might be
expected: they are treated as final static.)
```

```
===[SLIDE #11]===[MORE]=============================================

- Constructors, getters and setters are usually not represented in the UML.

More on collections:
http://www.codejava.net/java-core/collections/
        overview-of-java-collections-framework-api-uml-diagram

More on UML:
http://www.uml-diagrams.org/class-reference.html
http://www.codemanship.co.uk/parlezuml/tutorials/umlforjava/java_class_basi
c.pdf

A book with many UML diagrams and the corresponding code:
http://www.bk.psu.edu/faculty/bowers/ist311/morelli/instructor/resources/
        instructors_manual/morelliim.2e.pdf




====================================================================
```

Interfaces i herència múltiple en Java

- **L'herència múltiple**, entesa com a una subclasse que hereta de diverses superclasses, **no està permesa en Java**. Una subclasse pot heretar com a màxim d'una única superclasse
- No obstant això, **les interfaces ens permeten "simular" una espècie d'herència múltiple, limitada a l'adopció de comportament (mètodes)**




```
public class Superheroi extends
Lluitador, Ocell {
  //...
}
```
NO PERMÈS !

```
public class Superheroi implements
Lluitador, Volador {
  //...
}
```
OK !

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Preguntas