From Processing 2 Java

Sharing, Hiding, Inheritance and Composition

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Where innovation starts

Fast Recap Processing

- primitive types
- properties (variables)
- methods (functions)
- classes

- Examples…
  - Processing
  - Eclipse

- Note: Processing ≠ JAVA

```
cha  public class Shape {
byte     float x;
sho      float y;
int      float r;
long
floa     // constructor
dou      public Shape(float sx, float sy, float sr) {
boo          x = sx; y = sy; z = sz;
         }
voic
         void display() {
           // Shape doesn't display
         }
}
```

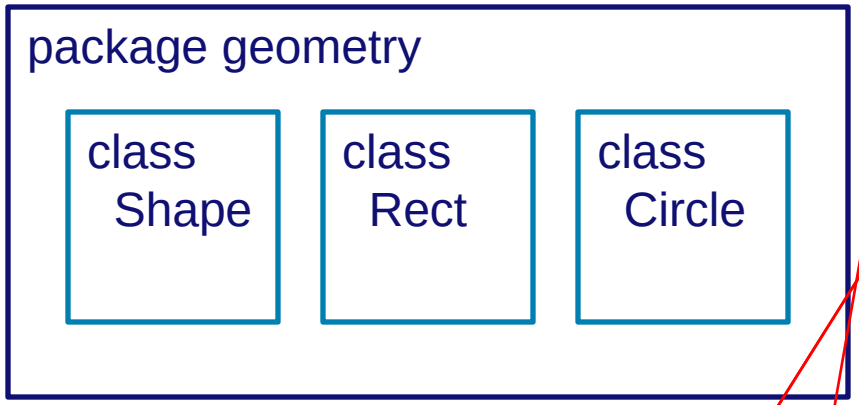
Why “Hide and/or Share” ?

- **Allows for separating functionality from implementation (implementation hiding).**
  - **What you *don’t* see you *can’t* use…**
  - **What you *do* see you *can* use**

- **Allows for creating libraries (=packages)**
  - **“independent” developed pieces of code**
  - **(possibly) maintained by other people**

Packages

- **Packages organise classes in a**
  - **Class access through <package**




```
public class Shape {
    float x;
    float y;
    float r;

import geometry.*;

class Test {
    Shape a;

    public static void main(String[] args) {
      a = new Shape(0,0,0);
      a.display();
    }
}
```

- **Package defined by** package
- **Package used by** import

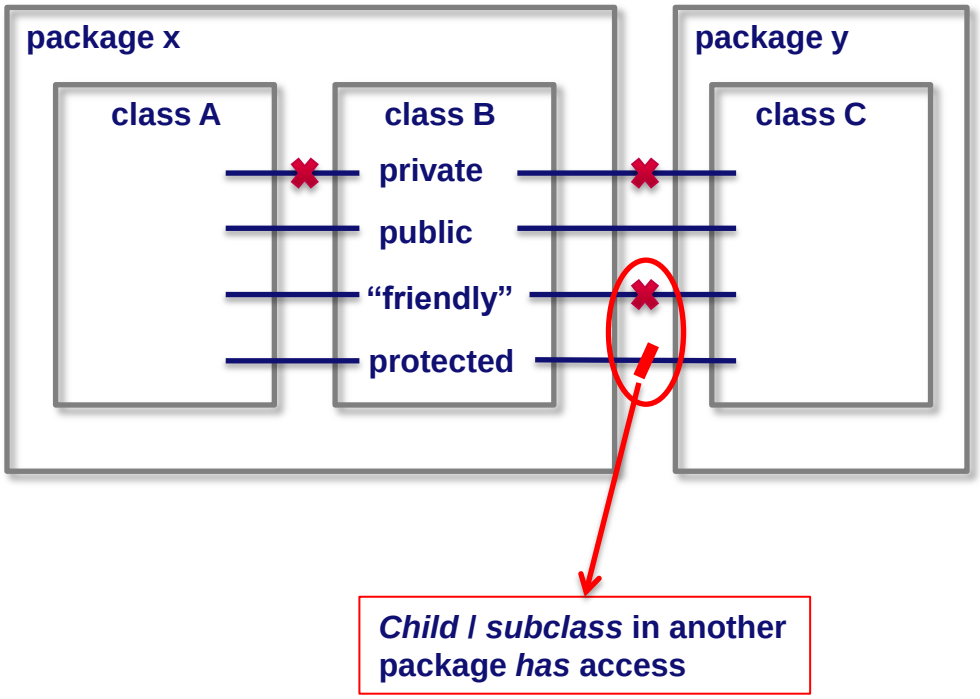
Access specifiers

- public : **everyone**
- protected : **package classes, subclasses and me**
- **“friendly”** : **package classes and me**
- private : **only me**

- **Limit access as much as you can…**

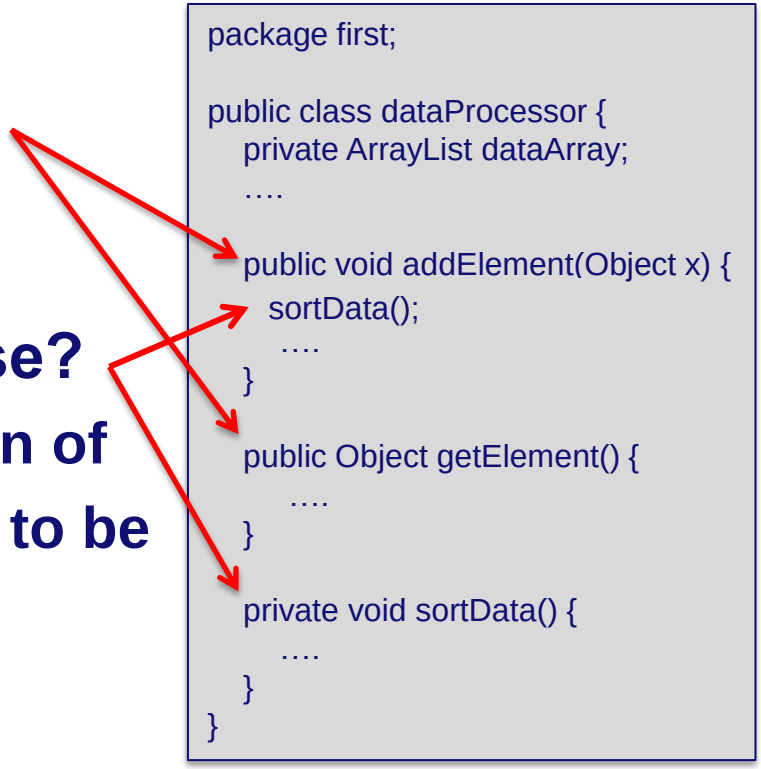
Access specifiers

- **public / private / “friendly” / protected**



Separating functionality and implementation

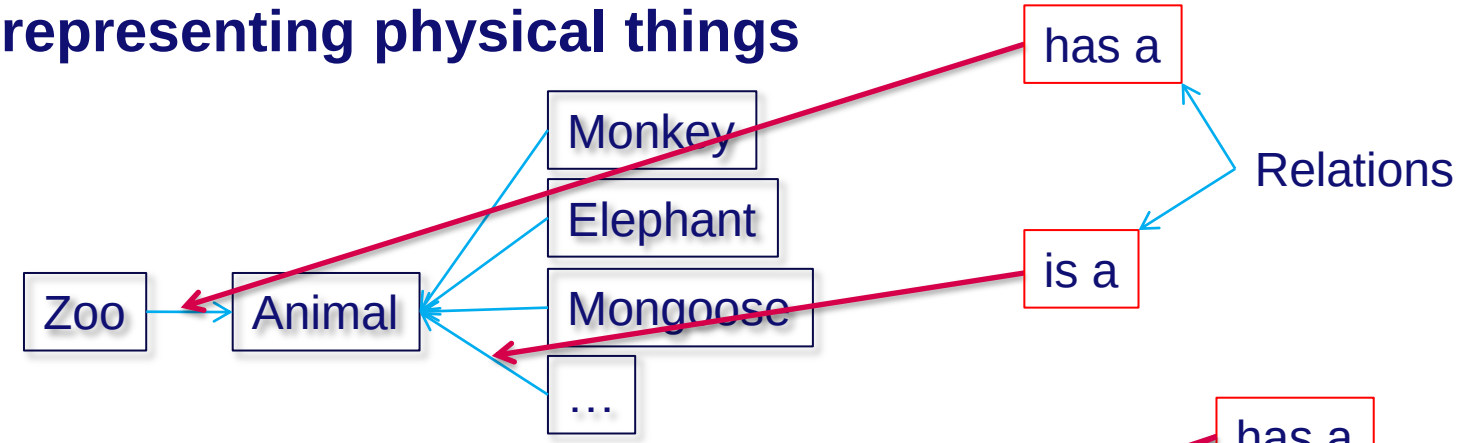
- **What you "see" is what you use**
  - **Interface / functionality offered…**
- **What you don't see you don't use?**
  - **Methods that help implementation of a class but that are not intended to be used by others.**



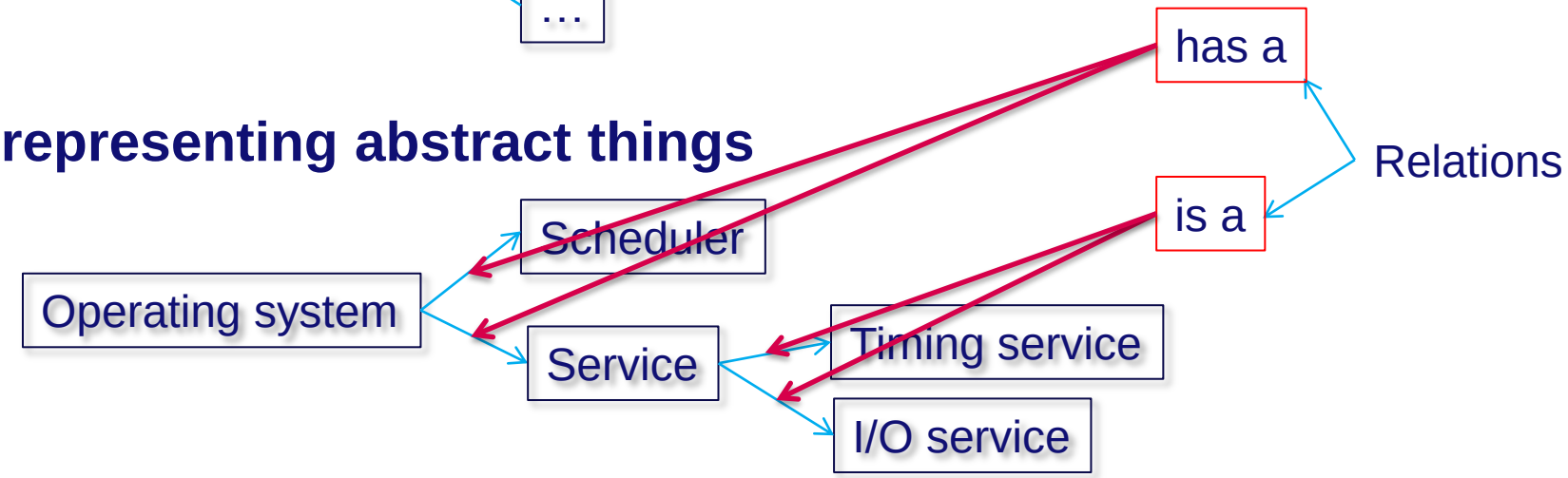
```
package first;

public class dataProcessor {
    private ArrayList dataArray;
    ….

    public void addElement(Object x) {
      sortData();
        ….
    }

    public Object getElement() {
        ….
    }

    private void sortData() {
        ….
    }
}
```

What about this OO ?

- **Think in *objects***
  - **representing physical things**



  - **representing abstract things**



Inheritance

- **keyword :** extends

```
package nl.tue.id.pp;

public class Shape {
    private int x; // x position
    private int y; // y position
    ….
    public void drawMe() {
        // what to do here?
    }
}
```

```
package nl.tue.id.pp;

class Rectangle extends Shape {
    private int w; // rectangle width
    private  int h; // rectangle height

    public void drawMe() {
        // draw the rectangle
    }
}
```

- create a new class that *inherits* all things public, and protected (and if in same package, also things “friendly”) **and** adds new functionality and/or properties.

Composition

- **Using other objects as properties**
- **NO inheritance of object properties in class**

```
package nl.tue.id.pp;

public class Rectangle {
    private int x; // x position
    private int y; // y position
    ….

    public Rectangle(int x, int y, int w, int h) {
        ….
    }

    public void drawMe() {
        …
    }
}
```

```
import nl.tue.id.pp.*;

public class Myap {
    private Rectangle r;

    public Myap() {
        r = new Rectangle(0,0,10,10);
    }

    public void draw() {
         r.drawMe();
        …
    }
}
```

Finalization

- data
  - constant by definition or initialization
- arguments
  - cannot be changed in method
- methods
  - cannot be overridden by subclass
  - allows for inline compilation
  - private methods are inherently final…
- class
  - cannot be inherited / extended

Live example

- Eclipse (ManyBoids)

Summary

- **Packages**
  - package, import
- **Sharing / Hiding**
  - public / protected / **“friendly”** / private
- **Inheritance**
  - extends **extending other objects**
- **Composition**
  - **using other objects**
- **Finalization**
  - **fixing the value**

Practical issues

- **Packages must be named**
  - **unique names (nl.tue.id.pp.geometry)**
- **Packages *must* adhere to a certain folder structure**
  - **nl.tue.id.pp → nl\tue\id\pp\...**
    → nl/tue/id/pp/…
- **Packages must be found…**
  - **CLASSPATH = .;D:\JAVA\lib;C:\somewhere\geometry.jar**

Useful links

- **Processing**
  - www.processing.org
- **OOP**
  - http://processing.org/learning/tutorials/objects/