



**ESPE**  
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### **Abstraction**

#### **Background**

- From a process perspective, abstraction is the act of bringing certain details to the forefront while suppressing all others.
- An abstraction is anything that exposures certain details that others can use and rely on.
- Some artifacts define their “public” details explicitly; others do not.
- Software abstraction requires developers to sift through large and diverse collections of details, and then determine the most salient and distinguishing concepts.

#### **EXAMPLE - ABSTRACTION OF “PERSONS”**

- List all the properties of persons who might be interesting to football (soccer) tournament tracking system.

Fast Tall Age Coordination Physical aptitude Weight Gender Equipment
---

## TWO COMMON PROBLEMS WITH ABSTRACTION

- **Leaky Abstraction:**
  - External characteristics are not defined as such.
  - This problem can be solved with good encapsulation.
- **Over Abstraction:**
  - Insufficient control given to users of the abstraction.
  - Inadequate access to the information embodied in the abstraction.

## ABSTRACTION

Abstraction is the act of summarizing or generalizing something to focus on the ideas most relevant to a conversation or certain kind of communication.

In object orientation, abstraction (the verb) is the creation of interfaces of a components, i.e., a class that exposes certain details necessary for working with that component.

An abstraction (the noun) is a description that leaves out unnecessary details.

“interfaces”, as found in C# and Java, are abstractions, but so are abstract classe

### Adherence Criteria:

- Meaningful labels and identifiers
- Context-aware labels and identifiers
- Explicit declaration of the full abstraction
- Abstraction sufficiency (completeness)
- Abstraction conciseness (non-redundancy)

## MEANINGFUL LABELS AND IDENTIFIERS

- A good name must be precise, it must not be too wide or too narrow, the way of speaking must be appropriate.
- Any kind of variable name, method name, etc.) are critical to good abstraction because they impact understanding.
- Class and variable names should be nouns or noun phrases and Methods names should be verbs.

## CONTEXT - AWARE LABELS AND IDENTIFIES

- Labels and identifiers should be redundant within the context they are declared and most often references.
- Examples from “Contacts”
- See person-only (java)/good
- See person-only (java)/poor abstraction – names not context-aware

## EXPLICIT DECLARATION OF AN ABSTRACTION

- In object-oriented (OO) languages, the public interface for a class consists of all the public elements (e.g., data members, methods, inner classes,

etc.)

- Some aspects of how developers use objects of a particular class cannot be captured in a class definition, e.g.,
  - Constraints of the order in which methods must be called
  - Constraints of specializations

An abstract class is a class that is designed to be specifically used as a base class. An abstract class contains at least one pure virtual function.

A pure virtual function is one which must be overridden by any concrete (i.e., non-abstract) derived class. This is indicated in the declaration with the syntax "= 0" in the member function's declaration.

The following is an example of an abstract class:

```
class AB {  
    public:  
        virtual void f() = 0;  
}
```

- accidentally exposed, e.g., when a method returns a modifiable object returns that is

## **ABSTRACTION SUFFICIENCY**

- Objects (instances of classes) are intended to be used.
- A class's abstraction represents what and how things can be done with an object.
- This adherence criterion requires the developer to ensure that users of a class can do what they need to do with the objects of that class.

## **ABSTRACTION CONCISENESS**

- To reduce complexity and increase maintainability, abstractions should not contain redundant mechanisms for the same things unless they are methods.
- The methods are either required for compatibility with legacy code or are also required form an adaptor.

### **Example of Abstraction Conciseness**

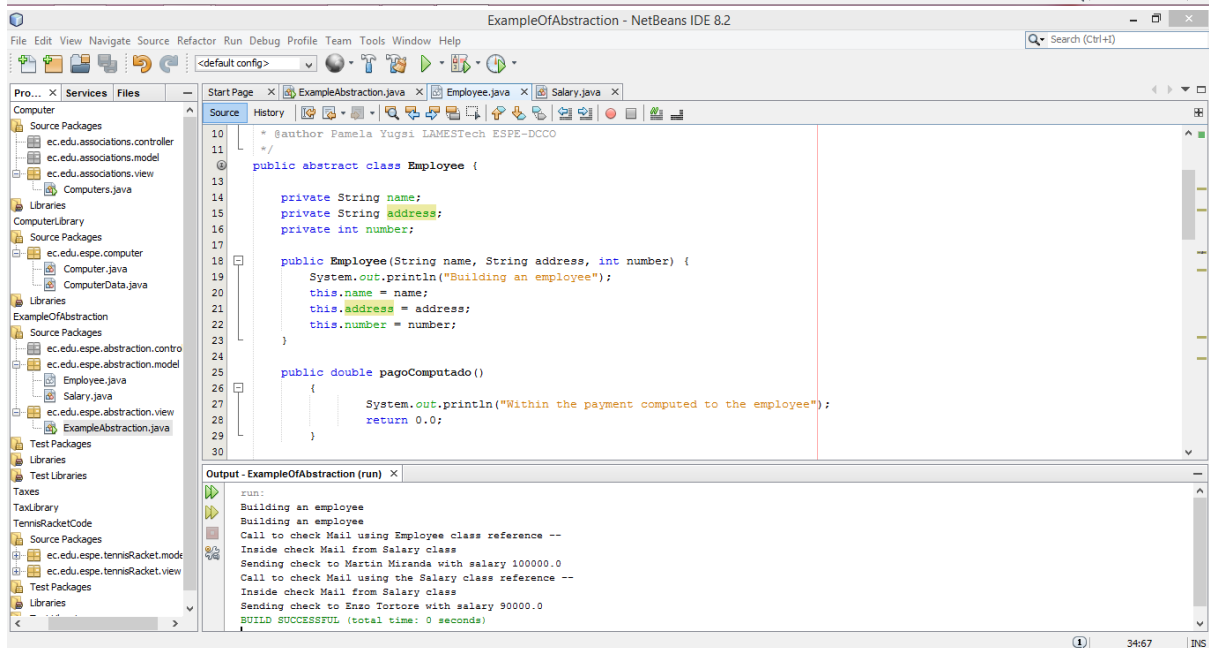
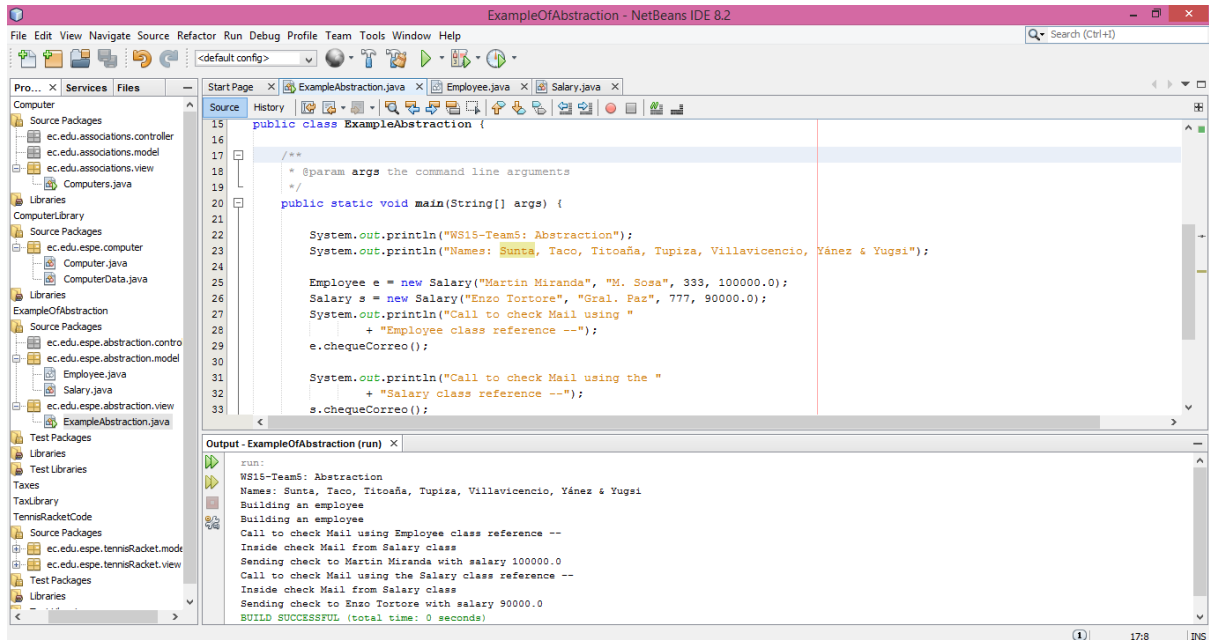
```
from abc import ABCMeta, abstractmethod  
  
class AbstractFoo:  
    __metaclass__ = ABCMeta  
  
    @abstractmethod  
    def bar(self):  
        pass  
  
    @classmethod  
    def __subclasshook__(cls, C):
```

```
return NotImplemented
```

```
class Foo(object):  
    def bar(self):  
        print "hola"
```

```
AbstractFoo.register(Foo)
```

**EXAMPLE:**<https://tinchicus.com/2019/05/23/java-abstraccion/>



```

7  /**
8   *
9   * @author Pamela Yugsi LAMESTech ESPE-DCCO
10  */
11
12  public class Salary extends Employee {
13
14      private double salary;
15
16      public Salary(String name, String address, int number, double salary) {
17          super(name, address, number);
18          setSalary(salary);
19      }
20
21      public void chequeCorreo()
22      {
23          System.out.println("Inside check Mail from Salary class");
24          System.out.println("Sending check to " + getName()
25                          + " with salary " + getSalary());
26      }
27

```

Output - ExampleOfAbstraction (run) x

```

run:
Building an employee
Building an employee
Call to check Mail using Employee class reference --
Inside check Mail from Salary class
Sending check to Martin Miranda with salary 100000.0
Call to check Mail using the Salary class reference --
Inside check Mail from Salary class
Sending check to Enzo Tortore with salary 90000.0
BUILD SUCCESSFUL (total time: 0 seconds)

```

## QUESTIONS

### 1. What is abstraction?

- a. It is based on another object or class, using the same implementation or behavior.
- b. The act of bringing certain details to the forefront while suppressing all others.**
- c. Minimize the domino effect when software changes occur in expected (and even some unexpected) ways.

### 2. A ..... includes all that is exposed to the users of the class, regardless of whether something is exposed.

- a. Developer.
- b. Language.
- c. Class's Abstraction.**

### 3. A class's abstraction represents what and how things can be done with an .....

- a. Object.**

b. Class.
c. Method.

<b>4. Abstraction: Adherence criteria</b>
a. redundancy.
b. Context-aware labels and identifiers.
c. labels and identifiers without text.

<b>5. What is the difference between an abstract class and a normal class?</b>
a. An abstract class must have at least one abstract method
b. An abstract class must have at least three conventional attributes
c. An abstract class and a normal class differ in their methods and attributes