



INFO 5100 :Application Engineering and Development

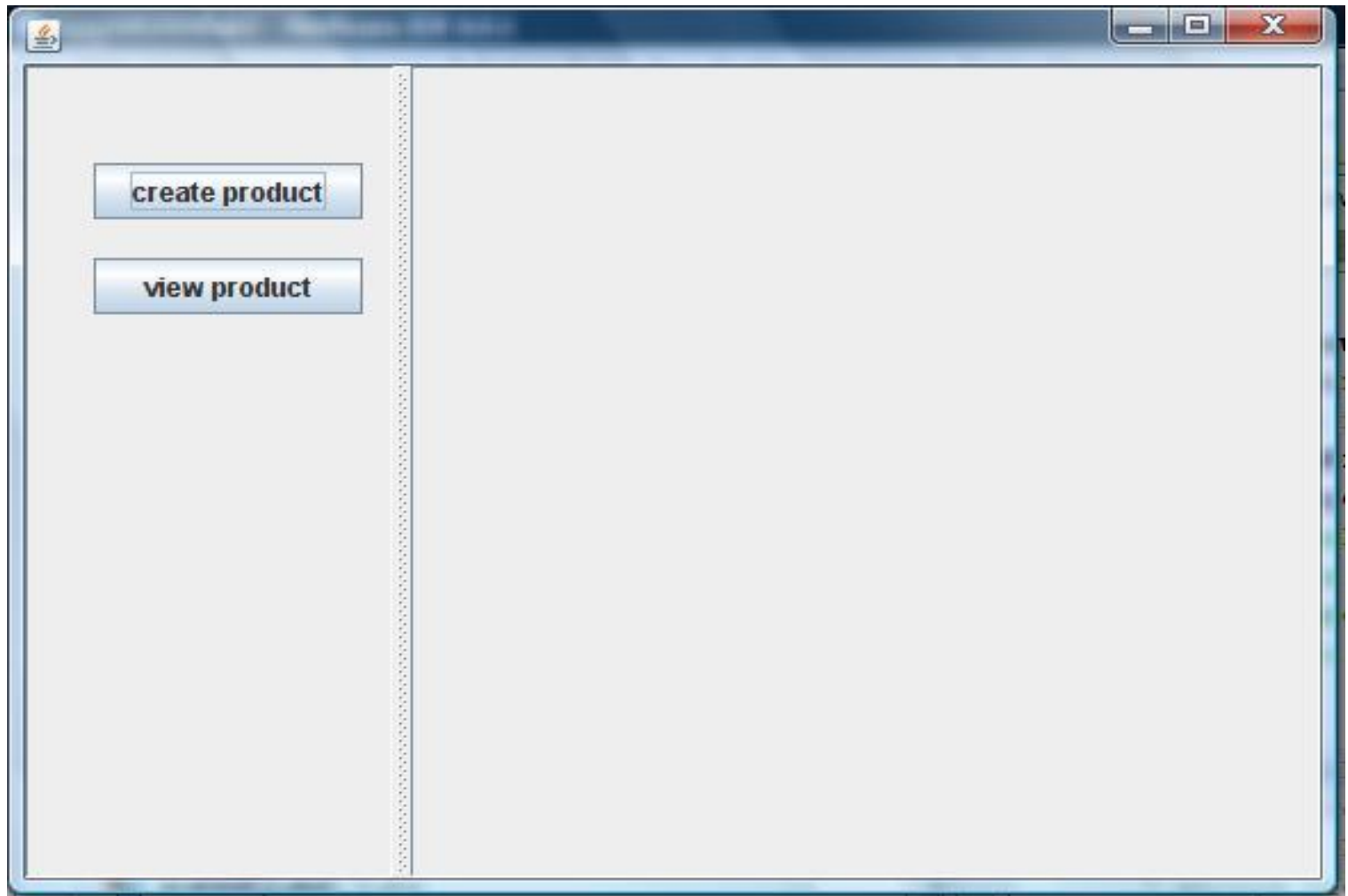
Lab I : Class + Object + Relationships



Objective

- Demonstrate how to create a java/swing application
- How to define java classes
- How to create and populate java objects
- How to pass data between from the JFrame to JPanels

Output Application I



Output Step I

Create Product

create product

view product

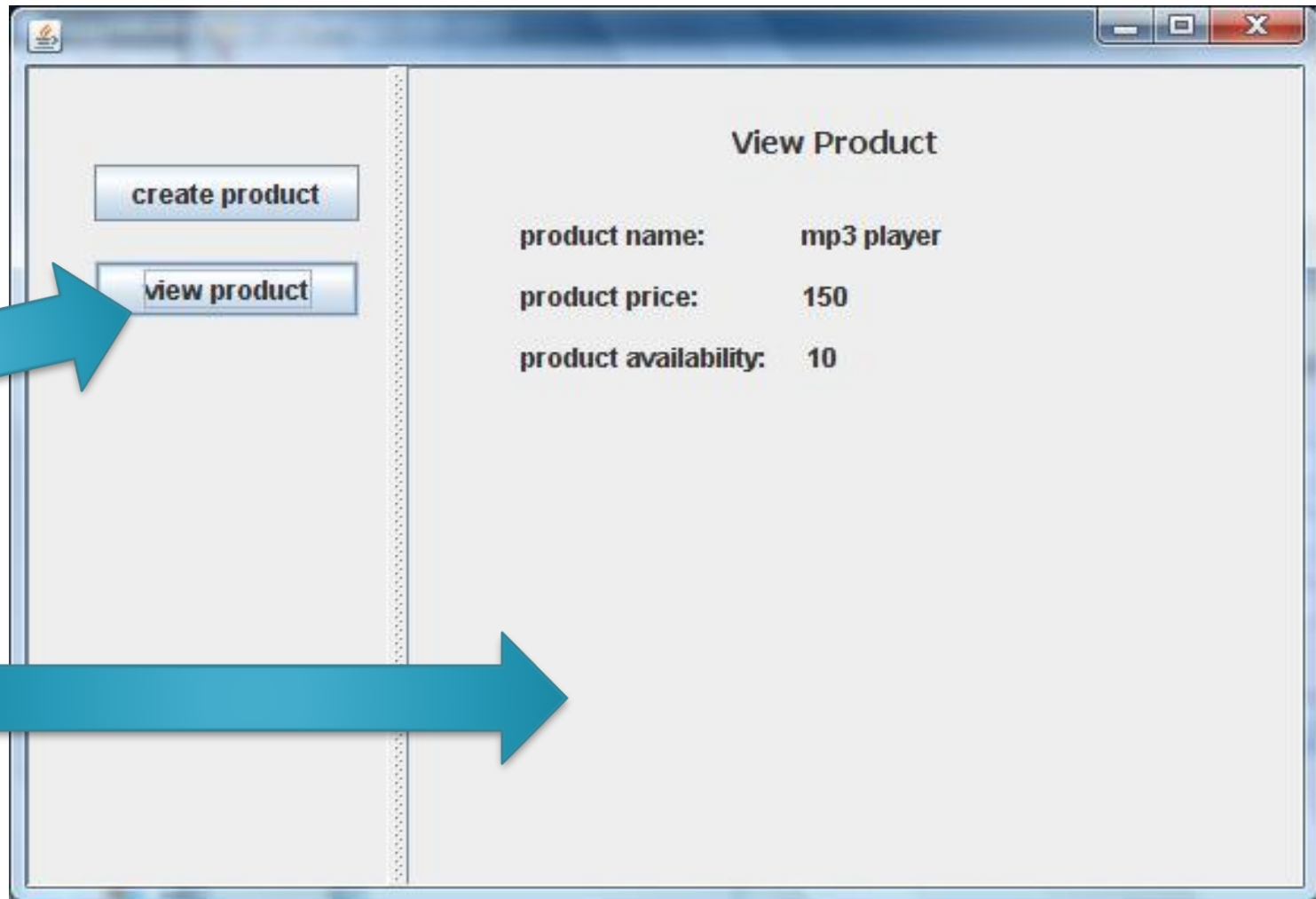
product name:

product price:

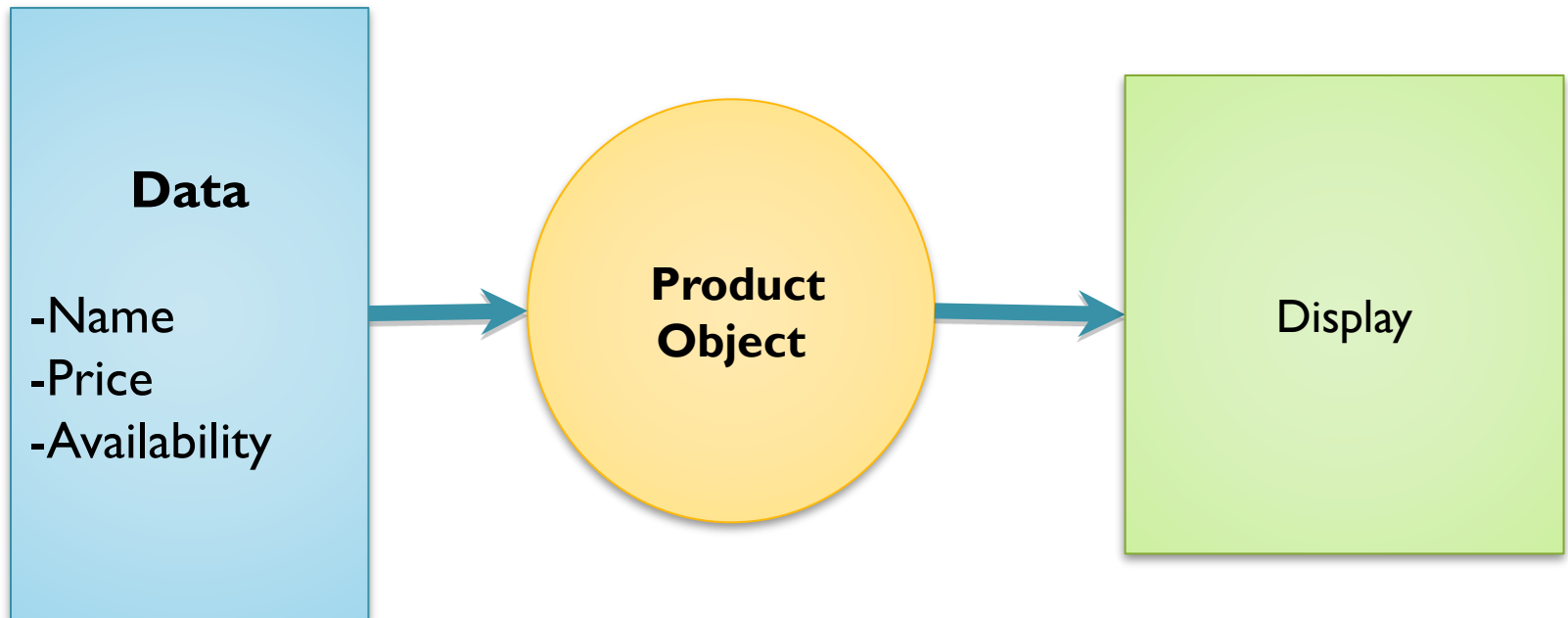
product availability:

create

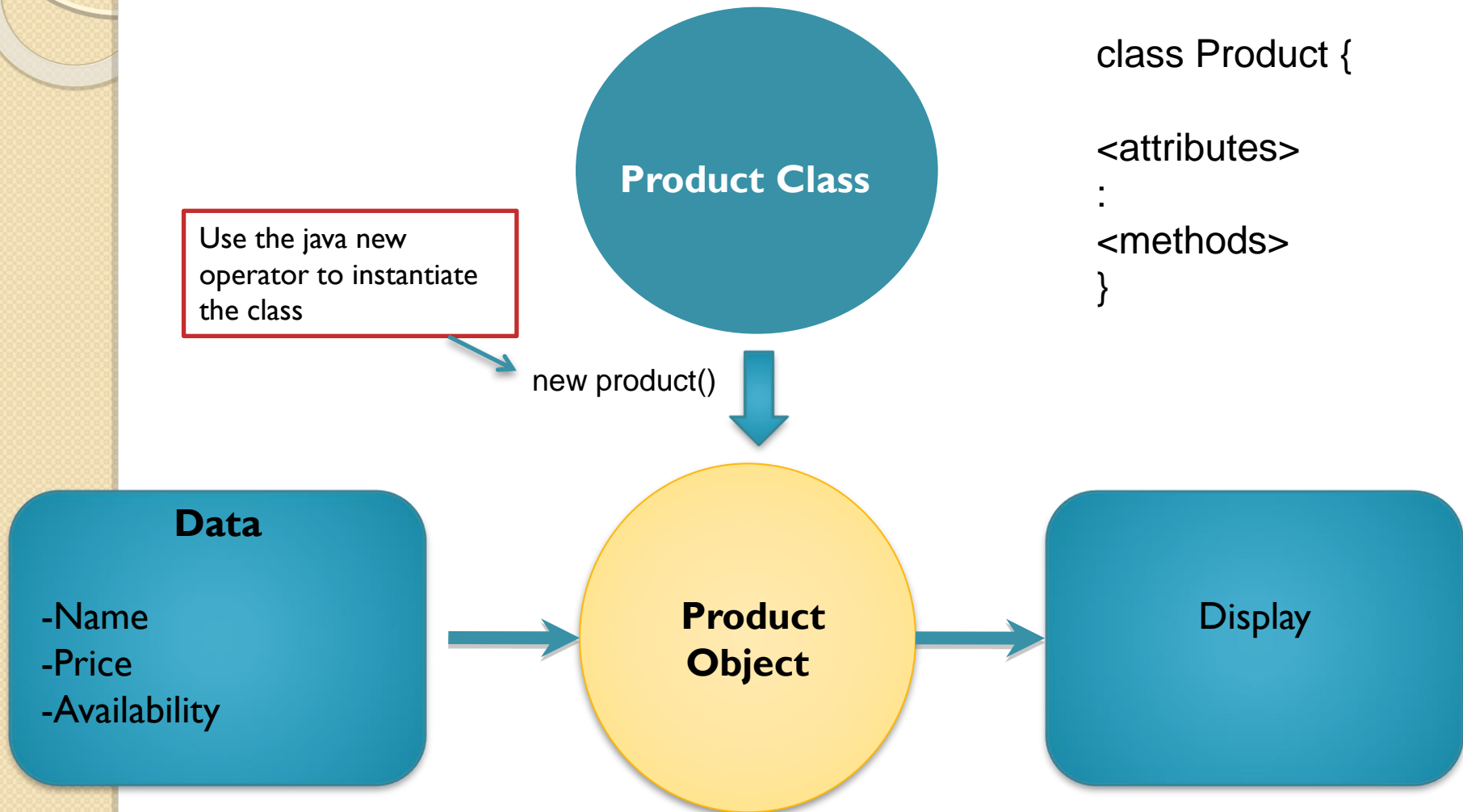
Output Step 2



How to create and move data in and out of objects?

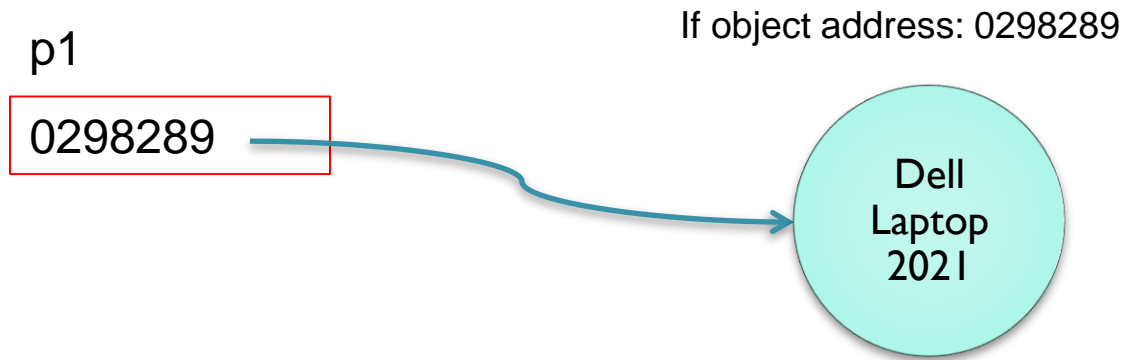


The approach:



Java Reference variables

1. When we create things we need to keep track of them. If not we would never be able to find them.
2. A reference variable has a name. We use the name to find the variable and then look inside to find information about where the object is
3. Memory space (a place holder) for keeping track of an object but it is not an object in itself
4. An object has a numeric address of where it can be found
5. We save the address inside the reference variable as a way to get hold of the object



Java Reference variables

```
//example class definition
Public class
Product {

String name;
Public Product(){

:
:
:
}
}
```

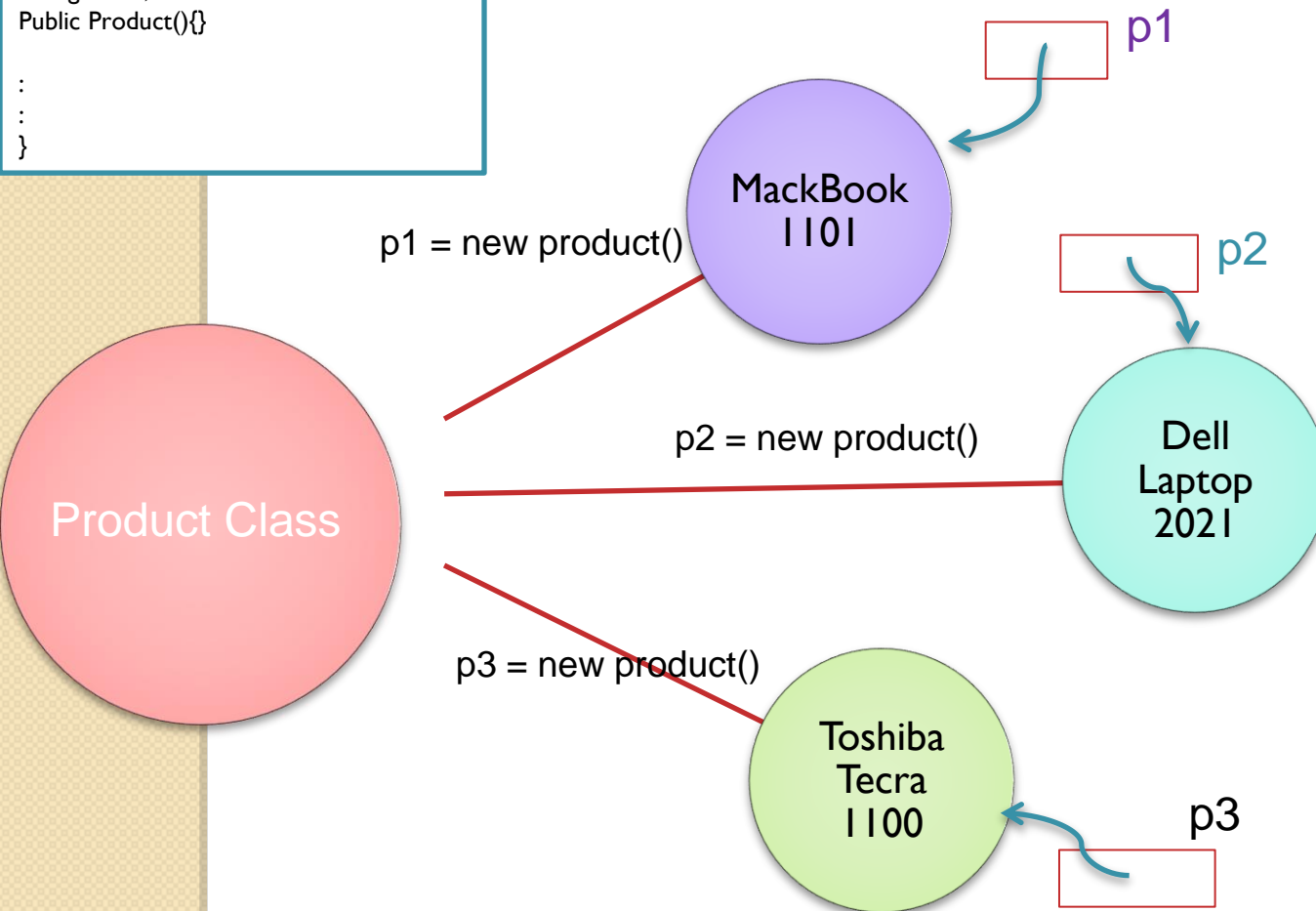
//Example main program:

```
public class Main {

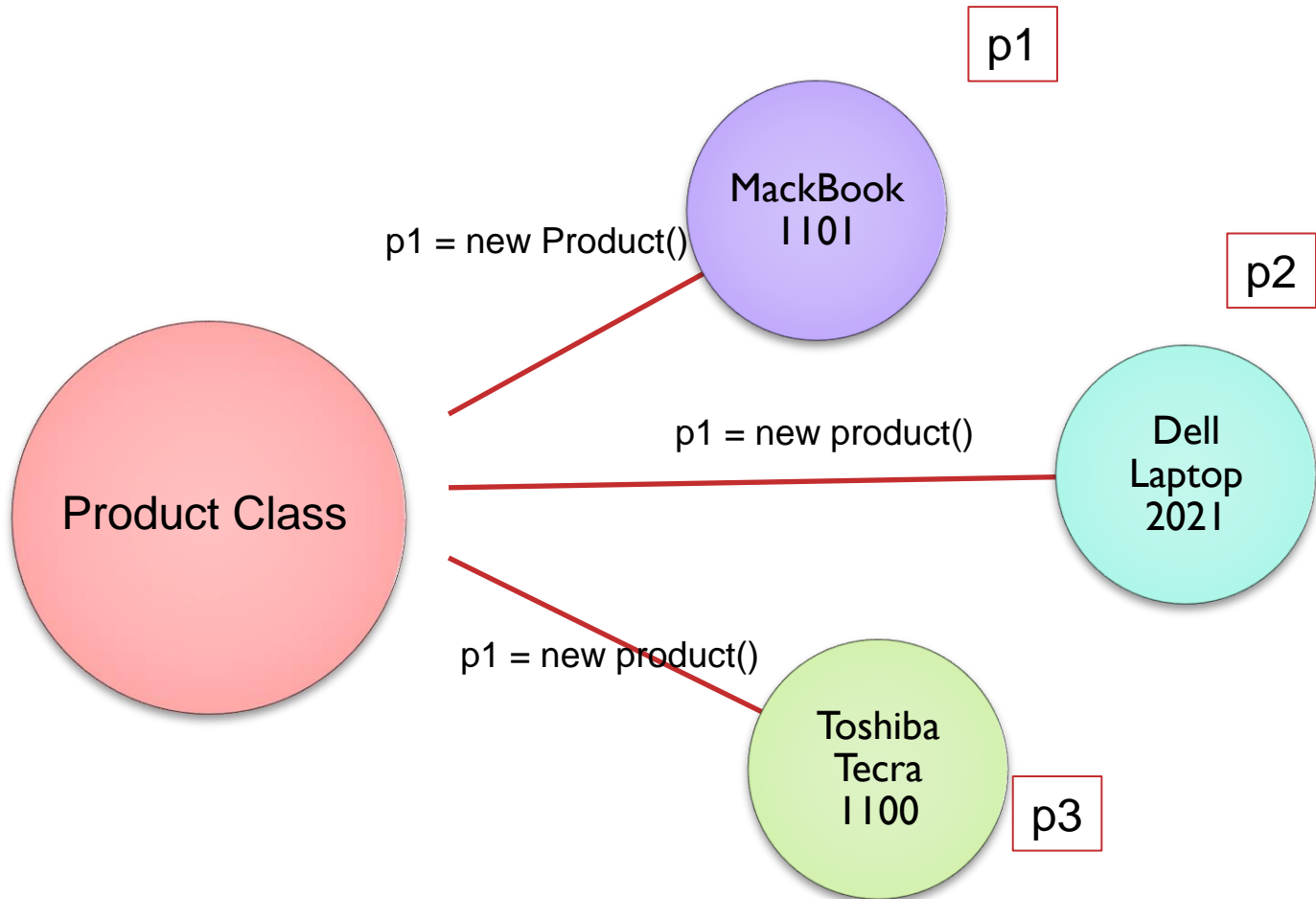
    public static void main(String[] args) {
        // TODO code application logic
        here

        Product p1 = new Product();
        p1.setName("MacBook ...");
        Product p2 = new Product();
        p2.setName("Dell ...");
        Product p3 = new Product();
        p3.setName("Toshiba ...");

    }
}
```

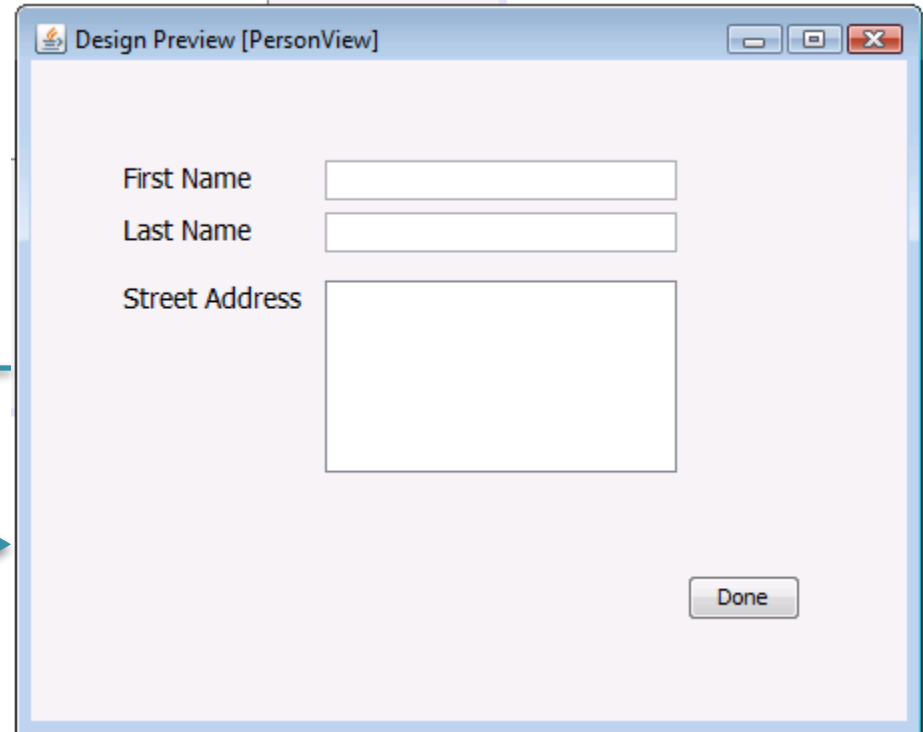


Instantiation: From classes to objects



Connecting components to UI

Person



A screenshot of a 'Design Preview [PersonView]' window. It contains three input fields: 'First Name' (a single-line text box), 'Last Name' (a single-line text box), and 'Street Address' (a multi-line text box). A 'Done' button is located at the bottom right of the window.

Person is an object that is an instance of class Person. Must be created using the new operator

Data attributes are accessed through their interfaces

Person

FirstName

LastName

Address

```
class Person {
```

```
    lastName: String  
    firstName: String  
    address:  String
```

```
    getLastName();  
    getFirstName();  
    getFullName();  
    getAddress();
```

```
    setLastName()  
    setFirstName()  
    setAddress();
```

```
}
```

Form fields correspond to data attributes

Person

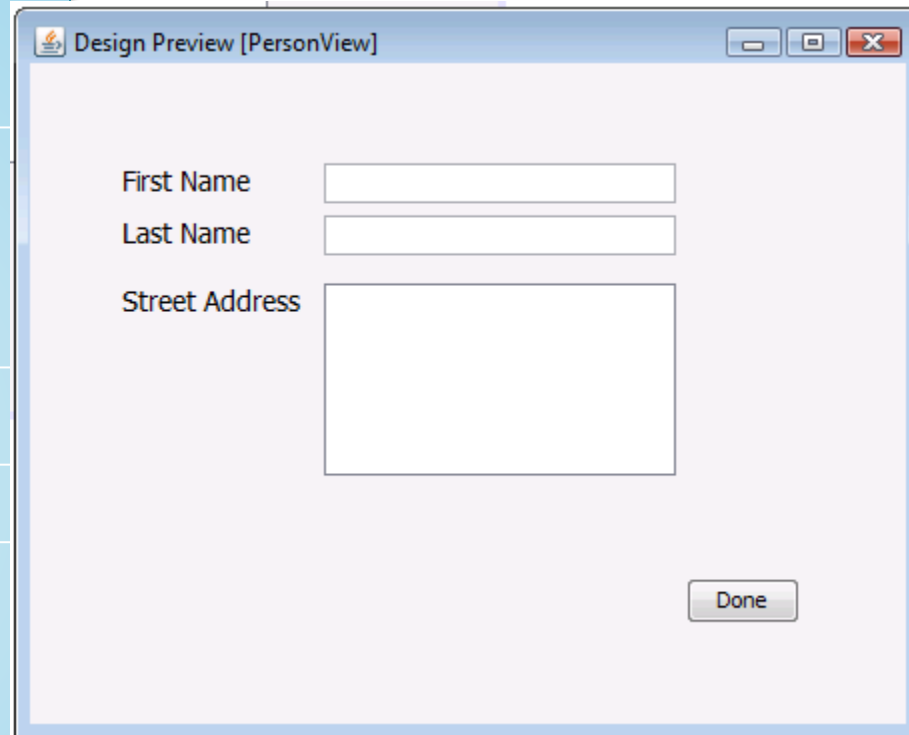
```
class Person {
```

```
    lastName: String  
    firstName: String  
    address:  String
```

```
    getLastName();  
    getFirstName();  
    getFullName();  
    getAddress();
```

```
    setLastName()  
    setFirstName()  
    setAddress();
```

```
}
```



The image shows a 'Design Preview [PersonView]' window. It contains three form fields: 'First Name' (a single-line text box), 'Last Name' (a single-line text box), and 'Street Address' (a multi-line text box). A 'Done' button is located at the bottom right of the window.

Form fields have names

Person

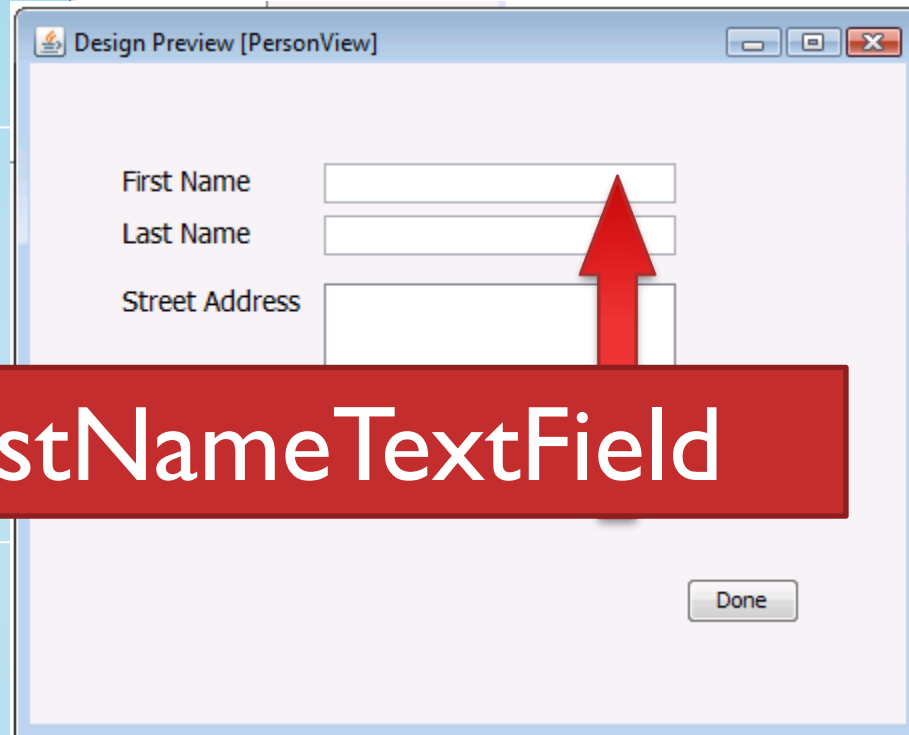
```
class Person {
```

```
    lastName: String  
    firstName: String  
    address: String
```

```
    getFullName();  
    getAddress();
```

```
    setLastName()  
    setFirstName()  
    setAddress();
```

```
}
```



Design Preview [PersonView]

First Name

Last Name

Street Address

Done

A red arrow points to the First Name text field.

Field name is **FirstNameTextField**

2

```
class Person {
```

Person

FirstName

LastName

Address

person

```
private String  
private String
```

```
getLastName();  
getFirstName();  
getFullName();  
getAddress();
```

```
setLastName()  
setFirstName()  
setAddress();
```

```
}
```

Person person = new Person();

Design Preview [PersonView]

First Name

Last Name

Street Address

Create New Person

```
Person p = new Person();  
String fn = firstnameTextField.getText();  
p.setFirstName(fn);  
....
```

1

```
class Person {
```

```
    lastName: String  
    firstName: String
```

```
    getLastName();  
    getFirstName();  
    getFullName();  
    getAddress();
```

```
    setLastName()  
    setFirstName()  
    setAddress();
```

```
}
```

Design Preview [PersonView]

First Name

Last Name

Street Address

3

```
String fn = FirstNameTextField.getText();
```

FirstName

LastName

Address

person

```
Person p = new Person();  
String fn = firstnameTextField.getText();  
p.setFirstName(fn);  
....
```



```
class Person {
```

```
    lastName: String  
    firstName: String
```

```
    getLastName();
```

```
    setLastName(String ln) {  
        setFirstName(ln);  
        setAddress();  
    }
```

```
}
```

Design Preview [PersonView]

First Name

Last Name

Street Address

3

```
String fn = FirstNameTextField.getText();
```

```
person.setFirstName(fn);
```

FirstName

LastName

Address

4

```
Person p = new Person();  
String fn = firstnameTextField.getText();  
....
```

person

Person

```
class Person {
```

```
    lastName: String  
    firstName: String  
    address: String
```

```
    getLastName();  
    getFirstName();  
    getFullName();  
    getAddress();
```

```
    setLastName()  
    setFirstName()  
    setAddress();
```

```
}
```

FirstName

LastName

Address

Design Preview [PersonView]

First Name

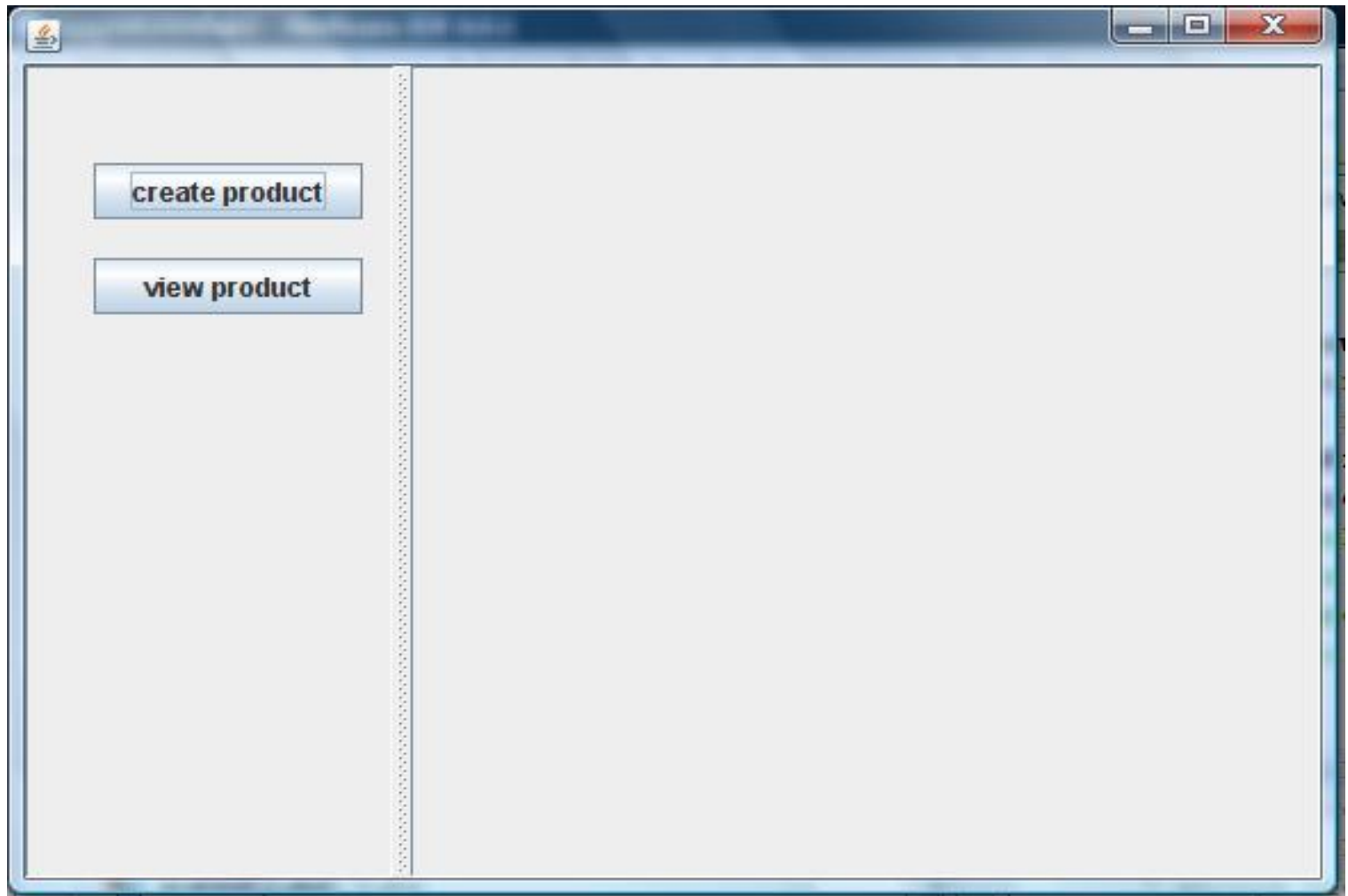
Last Name

Street Address

Create New Person

```
Person p = new Person();  
String fn = firstnameTextField.getText();  
p.setFirstName(fn);  
....
```

Output Application I



Output Step I

Create Product

create product

view product

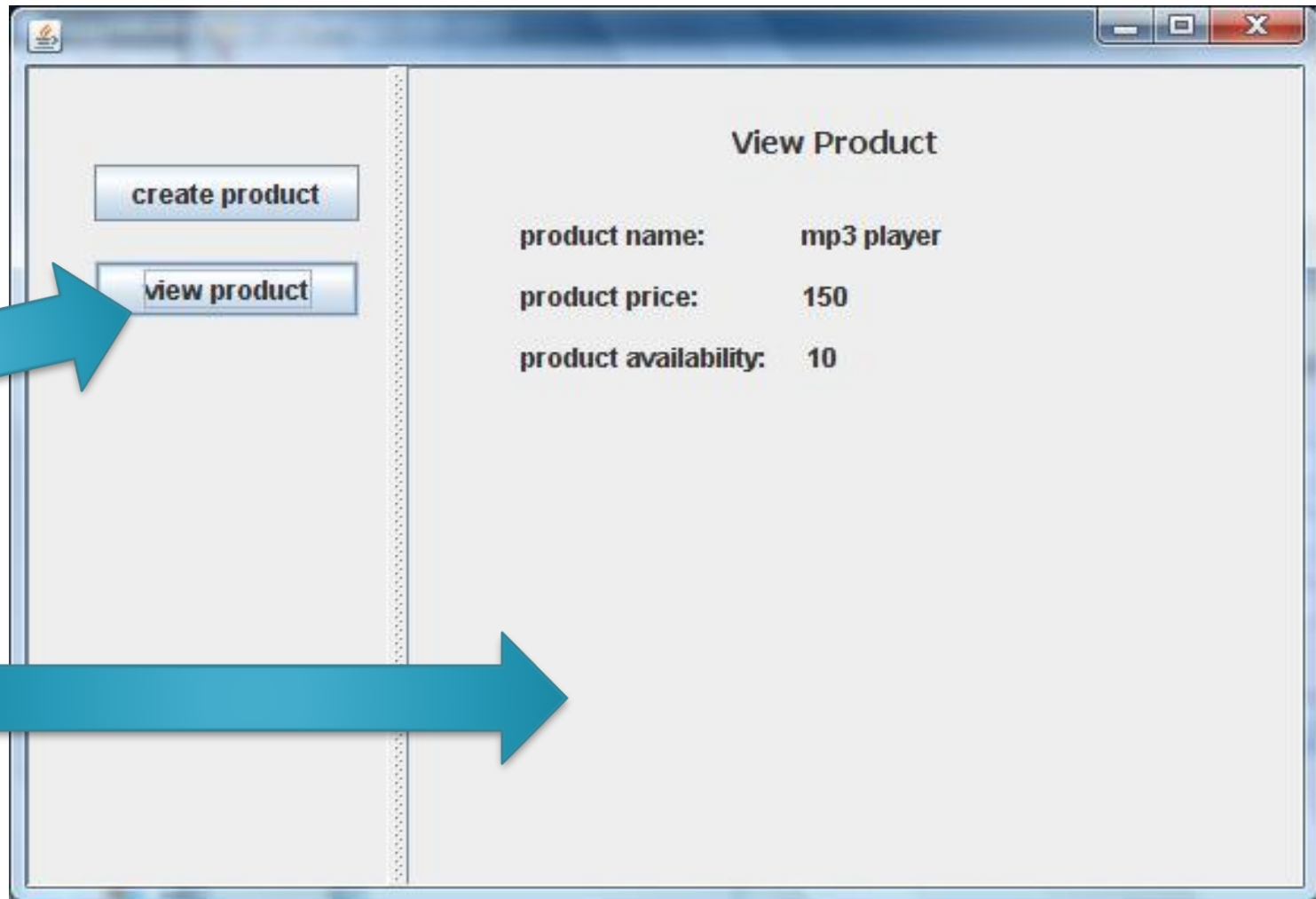
product name:

product price:

product availability:

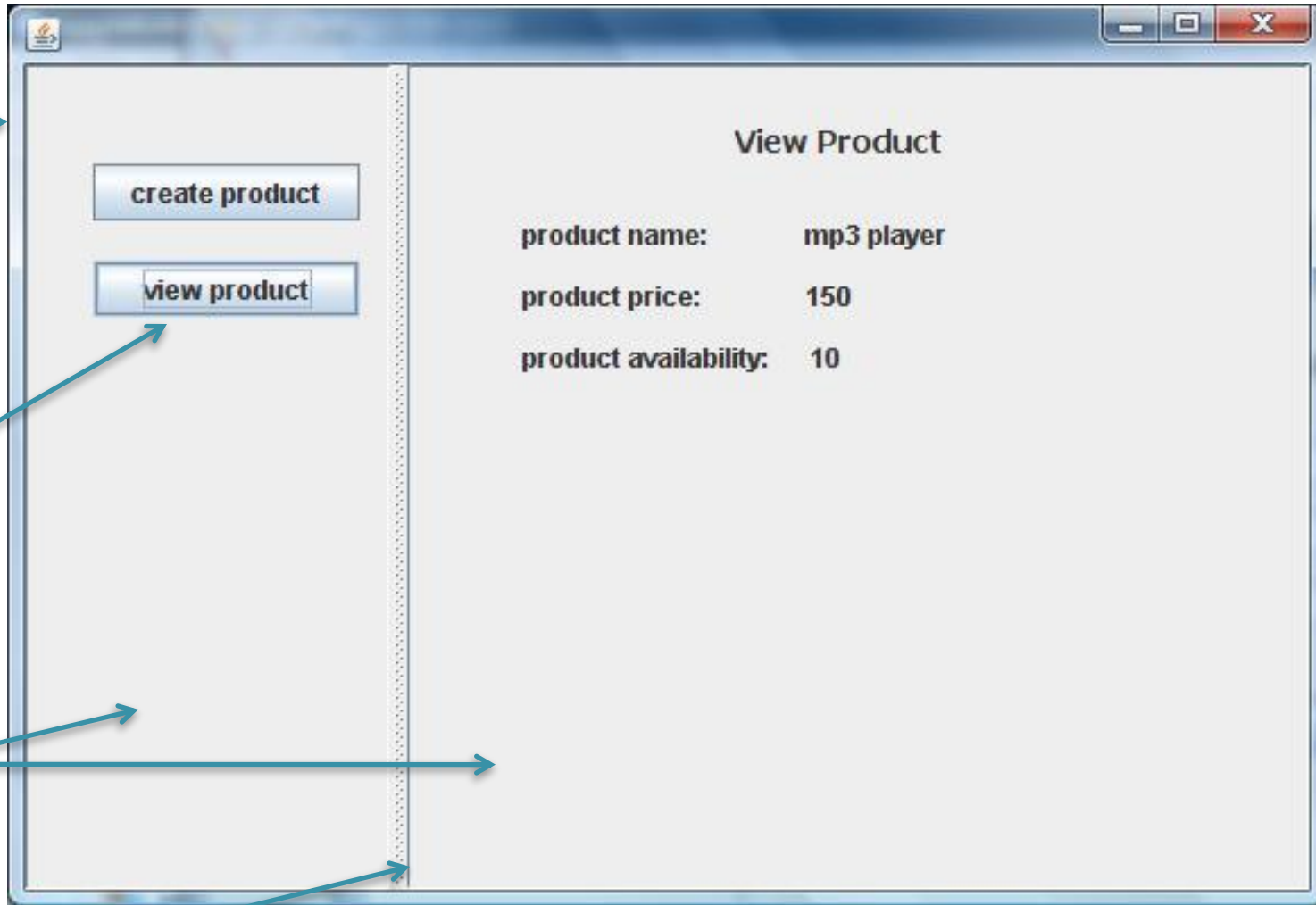
create

Output Step 2



Swing application structure

JFrame



JButton

JPanel

JSplitPane

One UI and two tasks (create/View)



Jframe (MainJFrame)

Jpanel for create a product

Jpanel for displaying a product

Pass the product object

Jframe (MainJFrame)

**Product
Object**

Customer

Create Product JPanel

**Product
Object**

Input fields

NameTextField

PriceTextField

Jframe (MainJFrame)

**Product
Object**

Customer

Create Product JPanel

Input fields

name
price

NameTextField

PriceTextField

Putting the display panels together

Jframe (MainJFrame)

**Product
Object**

**Product
Object**

Display Product JPanel

Output fields

NameTextField

PriceTextField

Putting the display panels together

Jframe (MainJFrame)

Display Product JPanel

**Product
Object**

Output fields

name

NameTextField

PriceTextField

price

Procedure

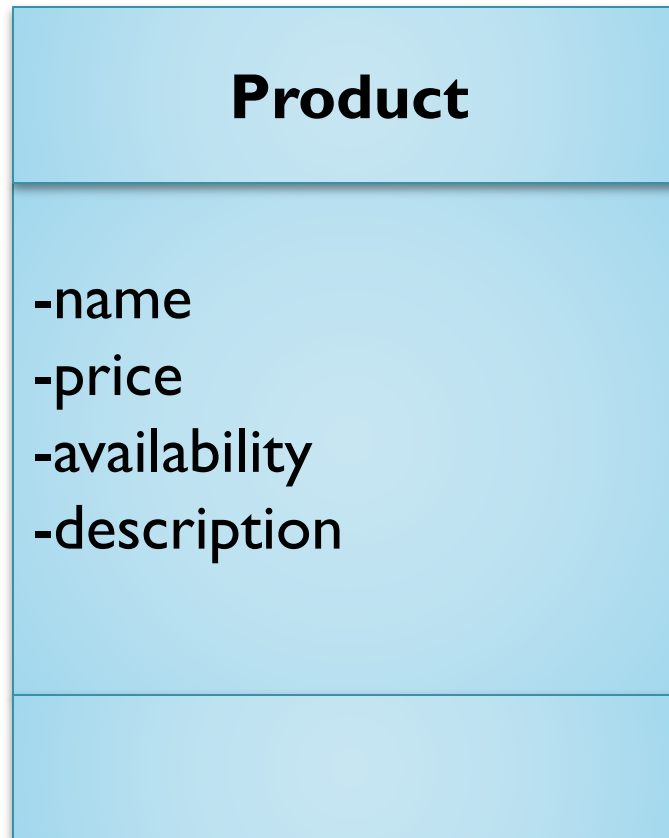
1. Create a new project
2. Define Business Package
 - Create product class
3. Define UserInterface Package
 - Define JFrame
 - Define Jpanels (Create and View)
 - Button listeners

Create Product Class

under the business package

Attribute

Method



Product Class

```
public class Product {  
  
    private String name;  
    private String price;  
    :  
  
    public String getName()    // retrieve data  
    {    return name;    }  
    :  
  
    public void setName(String n)    // keep data  
    {    name = n;    }  
    :  
}
```

Define MainJFrame Class

under the userinterface package

Create a global variable of product for this class

```
class MainJFrame {
```

Constructor



```
    public MainJFrame() {
```

```
        initComponents();
```

```
    }
```

```
}
```

Method that creates visual components



Define MainJFrame Class

under the userinterface package

Create a global variable of product for this class

```
class MainJFrame {
```

```
    private Product product; // Global Variable
```

```
    public MainJFrame() {
```

```
        initComponents();
```

```
        product = new Product(); // Instantiate the object  
        (global variable)
```

```
}
```


Define CreateProductJPanel class

under the userinterface package

```
class CreateProductJPanel () {
```

Constructor

```
    CreateProductJPanel () {  
        initComponents();  
    }
```

```
<other stuff>
```

```
}
```

Method that creates visual components

Define CreateProductJPanel class

under the userinterface package

```
class CreateProductJPanel() {
```

```
CreateProductJPanel(Product p) {  
    initComponents();  
    product = p;  
}
```

```
<other stuff>
```

```
}
```

Constructor



Create Product

- In the constructor of **CreateProductJPanel** class

```
public CreateProductJPanel(Product p) {  
    initComponents();  
  
}
```

View Product

- In the constructor of **ViewProductJPanel** class

```
public ViewProductJPanel(Product p) {  
    initComponents();  
    this.product = p;  
  
    nameTextField.setText(product.getName()  
));  
  
    priceTextField.setText(product.getPrice()  
));  
  
}
```

Button Events

When Create or View buttons are clicked on the left side, the following actions should be performed respectively.

Create Button

```
CreateProductJPanel j = new  
    CreateProductJPanel(product);  
jSplitPanel.setRightComponent(j);
```

View Button

```
ViewProductJPanel v = new  
    ViewProductJPanel(product);  
jSplitPanel.setRightComponent(v);
```

Create Button

When “create button” is clicked, following actions should be performed in the action perform method of the button

```
p.setName(nameField.getText()); //  
p.setPrice(priceField.getText());  
p.setAvailability(availabilityField.getText());
```

View Button

When “create button” is clicked, following actions should be performed in the action perform method of the button

```
nameTextField.setText(p.getName());
```

```
priceTextField.setText(product.getPrice());
```



Programming relationships

- Show how to implement relationships between classes
- Show how java works to connect and access objects
- Show how to traverse relationships

The Business Model

Person

First name,
Last name,
Social security number
DOB
Address Line 1,
Address Line 2,
City
Country
Zipcode

Etc



Example: One person multiple addresses

Joe,
Smith,
290-29-2974
2/2/1986
360 Huntington Ave
Snell Engineering
Boston
MA
USA
02115
Etc....

Work

Joe,
Smith,
290-29-2974
2/2/1986
100 Main Street,
Natick
MA
USA
01760
Etc....

Local

Joe,
Smith,
290-29-2974
2/2/1986
201 Best street
Cool-town
Shanghai
China

Etc

home

Multiple addresses means duplication of information and potential for errors

Joe,
Smith,
290-29-2974
2/21/1990
360 Huntington Ave
Snell Engineering
Boston
MA
USA
02115
Etc....

Work

Joe,
Smith,
200-29-2974
2/2/1986
100 Main Street,
Natick
MA
01760
USA
Etc....

Local

Joe,
Summer,
290-29-2974
2/2/1986
201 Best Street
Cool-town
Shanghai
China

Etc

home

What if we split the info into:

First name,
Last name,
Social security
number
DOB

Address Line 1,
Address Line 2,
City
Country
Zipcode



What if we split the info into:

First name,
Last name,
Social security
number
DOB
Address



Personal information

Address Line 1,
Address Line 2,
City
Country
Zipcode

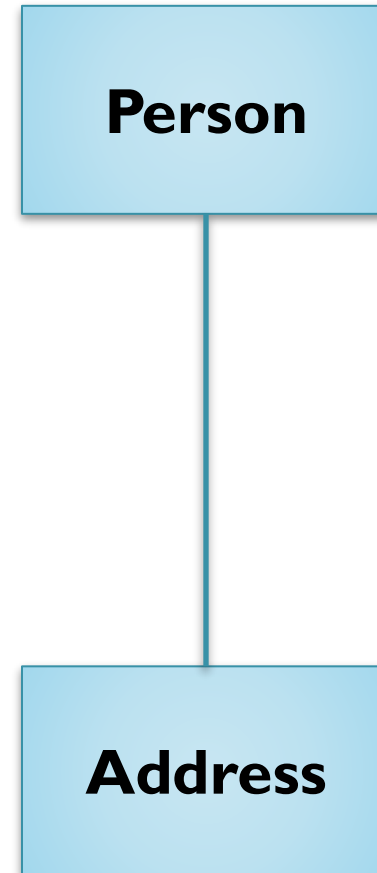


Address specific

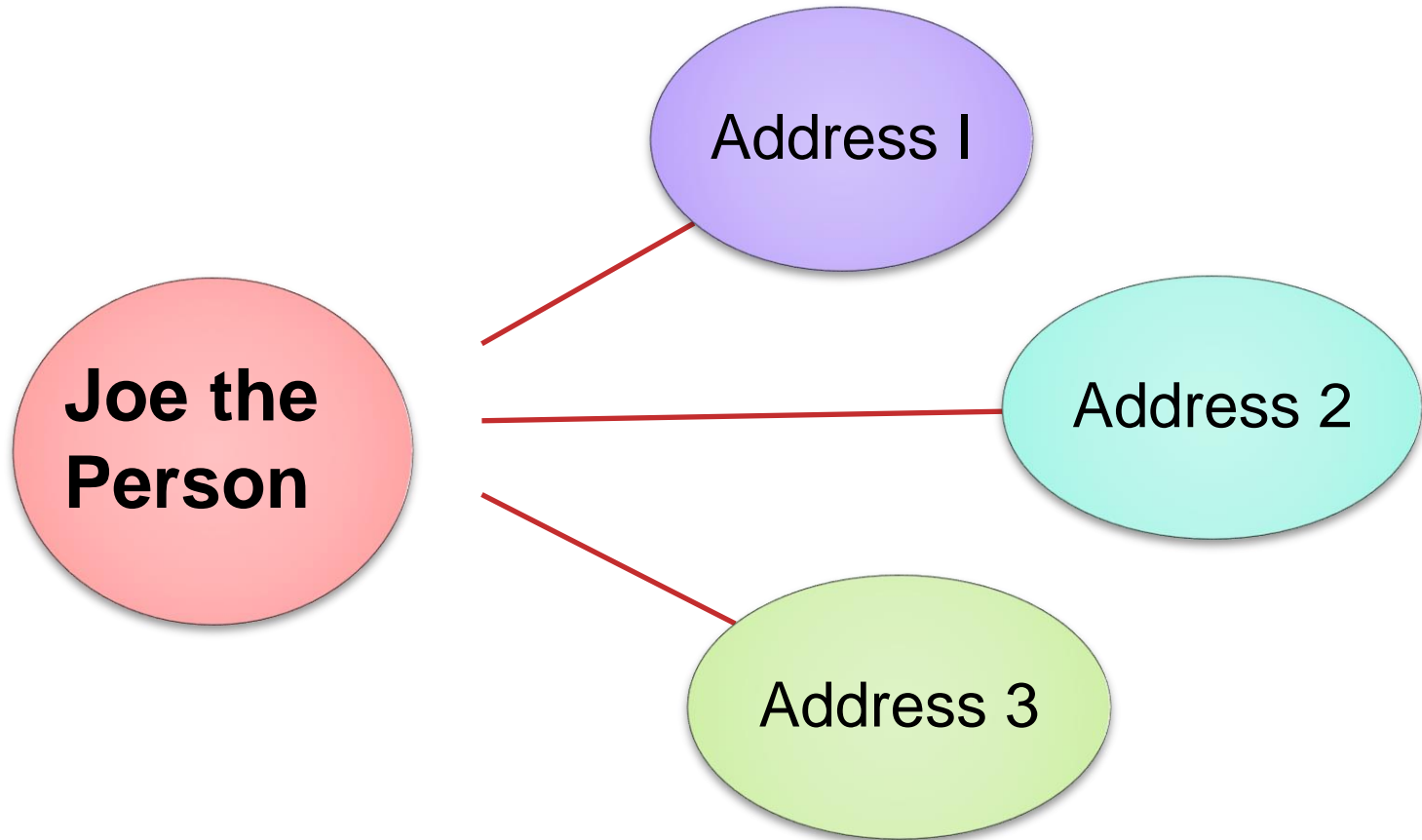
What if we split the info into:

First name,
Last name,
Social security
number
DOB
Address

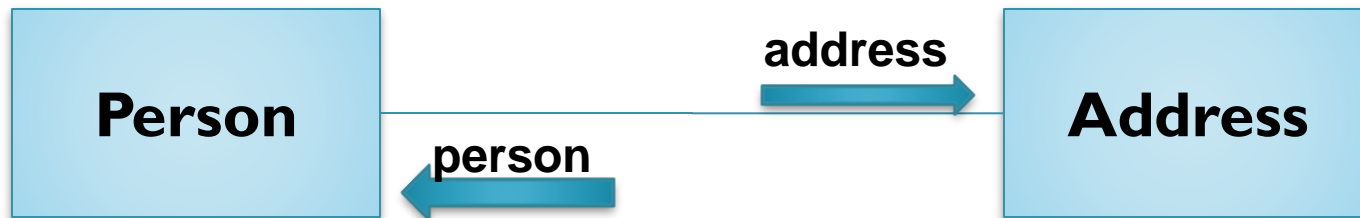
Address Line 1,
Address Line 2,
City
Country
Zipcode



One person object linked to three address objects each keeping track of one address



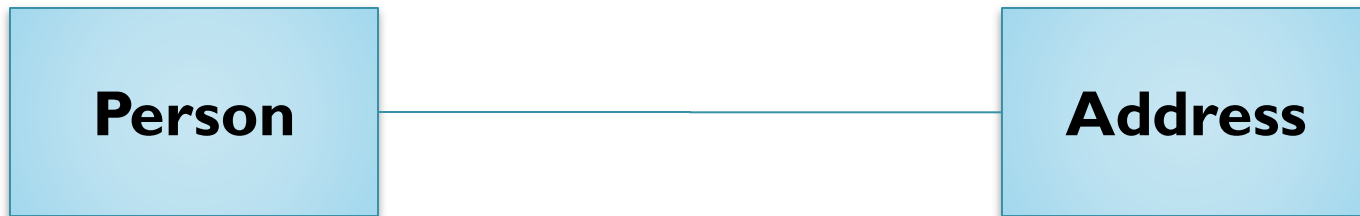
A reference variable is needed in the person class to keep track of the address object



From the person perspective, we must add

- 1) An address attribute which will serve as a reference variable to the address object
- 2) getAddress method to retrieve the address object
- 3) setAddress method to store the address object as part of the person

But how do we differentiate different kinds of addresses from each other such as work, home,...?



Answer: we can't with this kind of relationship unless we add an address type attribute to the address class

View Person Profile Screen

Design Preview [PersonView]

Person Profile

First Name

Last Name

Street Address

DOB (YYYY/MM/DD)

Work Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Local Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Sweet home Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Person Profile

First Name

DOB (YYYY/MM/DD)

Last Name

Street Address

Work Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Local Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Sweet home Address

Street Line 1

Street Line 2

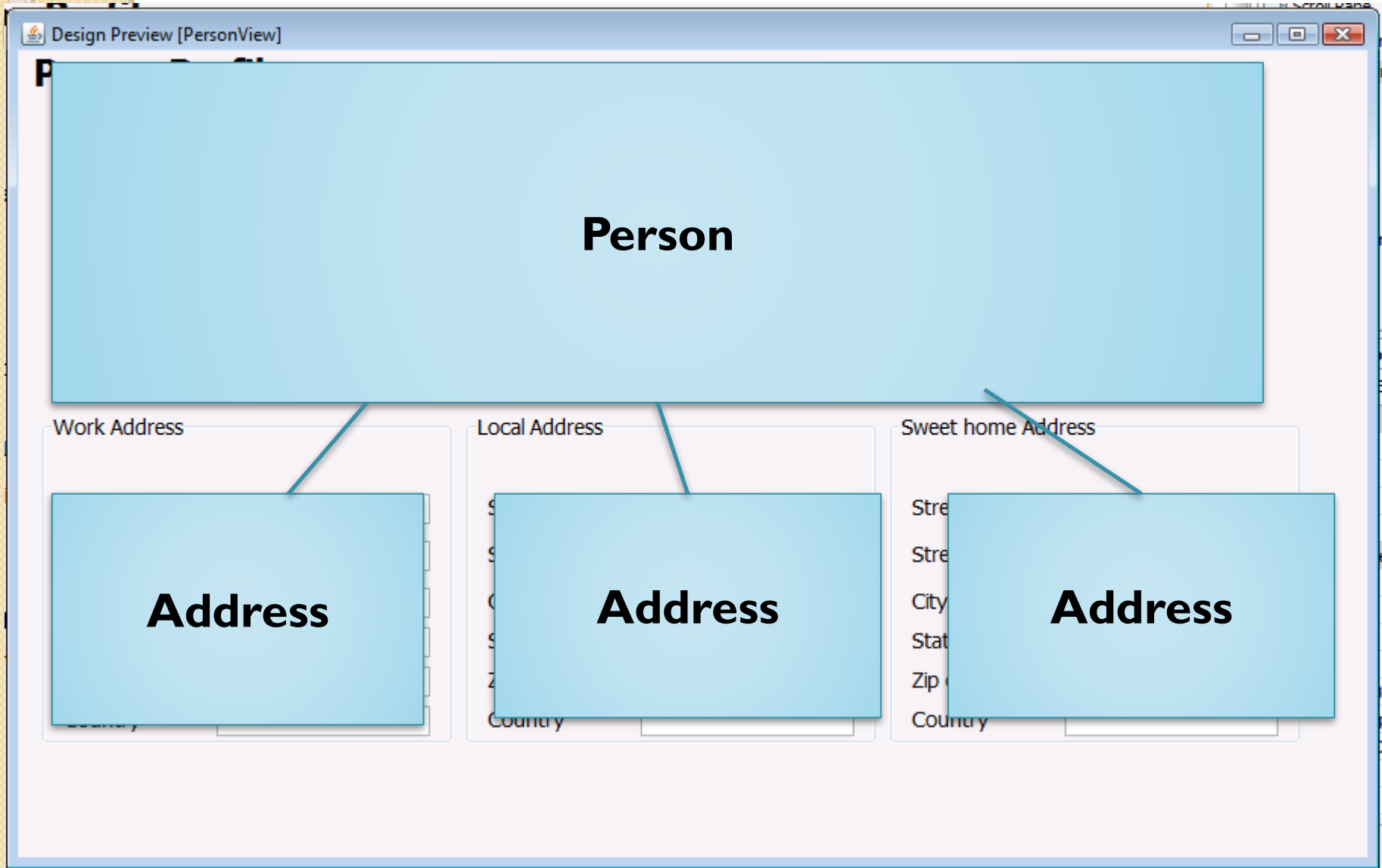
City

State

Zip code

Country

Matching the model to the user interface



Person Profile

First Name

DOB (YYYY/MM/DD)

Last Name

Street Address

Work Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Local Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Sweet home Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Changes are localized at the single address – person info remains fixed

Design Preview [PersonView]

Person Profile

First Name: Joe DOB (YYYY/MM/DD): 5/02/02

Last Name: Smith

Street Address: 360 Huntington
Boston MA 012115
USA

Work address

Street Address: 360 Huntington Ave
City: Boston
State: MA
Zip code: 02115
Country: USA

Local address

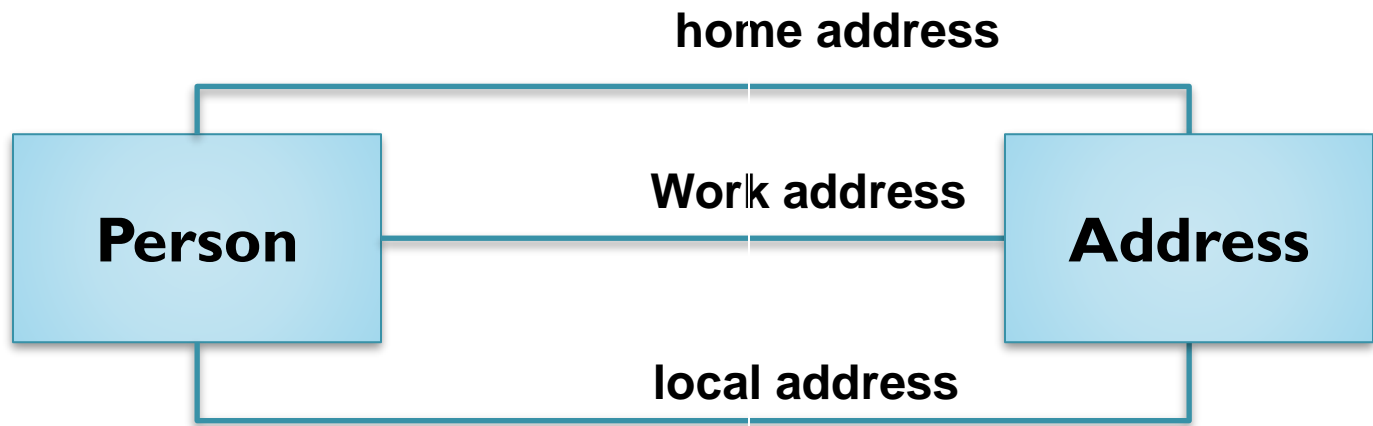
Street Address: 123 Main Street
City: Boston
State: MA
Zip code: 01760
Country: USA

Home address

Street Address: 456 Elm Street
City: Boston
State: MA
Zip code: 02115
Country: China

Display

Update object from user





```
Class Person {
```

```
String lastName;
```

```
String firstName;
```

```
Address workaddress;
```

```
Address homeaddress;
```

```
Address localaddress;
```

```
public Address getWorkAddress(){
```

```
Return workaddress;
```

```
}
```

```
Public void setWorkAddress(Address addressparam){
```

```
Workaddress = addressparam;
```

```
}
```

```
:::
```

```
}
```


Class Person {

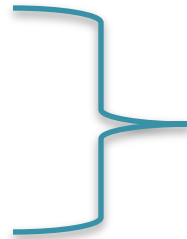
String lastName;

String firstName;

Address workaddress;

Address homeaddress;

Address localaddress;



3 reference variables for
keeping track of the 3
addresses

public Address getWorkAddress(){

Return workaddress;

}

Public void setWorkAddress(Address addressparam){

Workaddress = addressparam;

}

...

}

Implementation of the class Person

```
Class Person {
```

```
String lastName;
```

```
String firstName;
```

```
Address workaddress;
```

```
Address homeaddress;
```

```
Address localaddress;
```



The reference variables hold addresses only. The must be declared of type Address

```
address(){
```

```
ss(Address addressparam){  
aram;
```

```
:::  
}
```



```
Class Person {
```

```
String lastName;
```

```
String firstName;
```

```
Address workaddress;
```

```
Address homeaddress;
```

```
Address localaddress;
```

```
public Address getWorkAddress(){
```

```
Return workaddress;
```

```
}
```

```
Public void setWorkAddress(Address addressparam){
```

```
Workaddress = addressparam;
```

```
}
```

```
:::
```

```
}
```

Implementation of the class Person

```
Class Person {
```

```
String lastName;
```

```
String firstName;
```

```
Address workaddress;
```

```
Address homeaddress;
```

```
Address localaddress;
```

```
public Address getWorkAddress(){
```

```
return workaddress;
```

```
,
```

The get method returns the workaddress object.
The return value must be of type Address

```
}
```

```
:::
```

```
}
```

Implementation of the class Person

Class Person {

The set method returns nothing (void). It takes an address object as an input parameter and saves it in the workaddress attribute. As a result the person would be linked to an address object as the work address.

}



```
Public void setWorkAddress(Address addressparam){  
workaddress = addressparam;
```

```
}
```

```
:::
```

```
}
```

Implementation of the class Person

```
Person person = new Person();
```

```
person.setFirstName("Joe");  
person.setLastName("Smith");
```

```
Address address = new Address();  
address.setAddressLine1("360 Huntington Ave");  
person.setWorkAddress(address); //save address object as a work address
```

```
address = new Address(); // create new address object using the same ref variable  
address.setAddressLine1("100 Main Street"); //insert address info  
person.setLocalAddress(address); //save address object as a local address
```

```
address = new Address();  
address.setAddressLine1("201 Best Street");  
Person.setHomeAddress(address);
```

Consider the following form

Design Preview [PersonView]

Person Profile

First Name

Last Name

Street Address

DOB (YYYY/MM/DD)

Work Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Local Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Sweet home Address

Street Line 1

Street Line 2

City

State

Zip code

Country

Exercise I

- Define a project with a main class.
- Define the classes as described
- In the main method do the following:
Create a person object and three address objects. Initialize the objects with sample data.
Use the `system.println` function to print all your data in a format like the following:

Person

1. First name :Joe
2. Last name: Smith

Work Address

1. Address Line 1: 360 Huntington Ave.
2. Etc....

Exercise 2

- Define a project with a JFrame
- In the constructor for the JFrame initialize a person object and three address like before.
- Pass the person object to a JPanel to display the person info as showing the form defined earlier.
- In the constructor for the JPanel display the person and 3 addresses to the JPanel form.