



Sacred Valley, Peru
@ March 2006 by Usa Sammapun

Composition

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Composition

- Has an instance variable with an object type
 - Has-A relationship between class/objects
- Instance variables can be divided into two categories
 - primitive type (and String type) — attribute, fields
 - object type — composition

Composition

- Composition helps break long code into
 - several pieces of modular code
- Benefits of composition (modular code)
 - easy to understand
 - easy to reuse code
 - easy to change / extend feature
 - easy to debug

ATM Example

<https://github.com/ladyusa/atm>

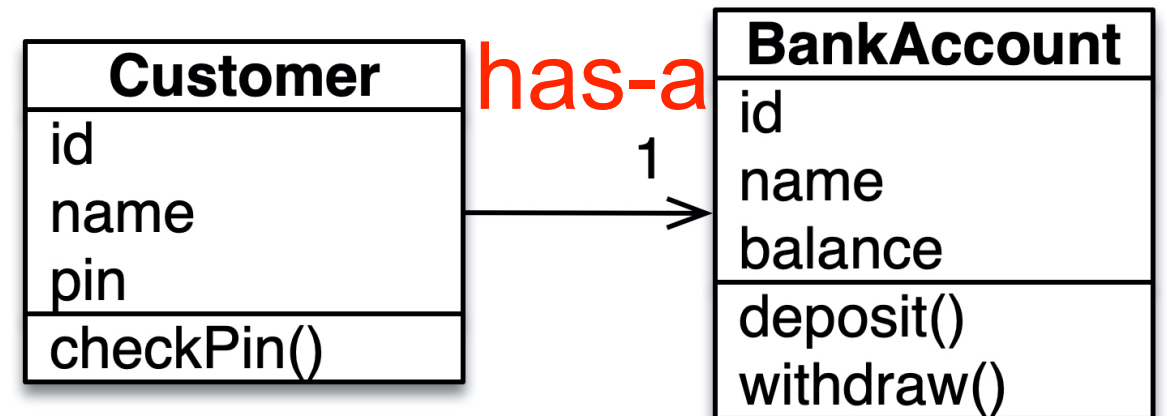
ATM Example

```
public class BankAccount {  
  
    private int id;  
    private String name;  
    private double balance;  
  
    // . . . code . . .  
}
```

```
public class Customer {  
  
    private int id;  
    private String name;  
    private int pin;  
  
    private BankAccount account;  
  
    // . . . code . . .  
}
```

} attribute, field

} composition



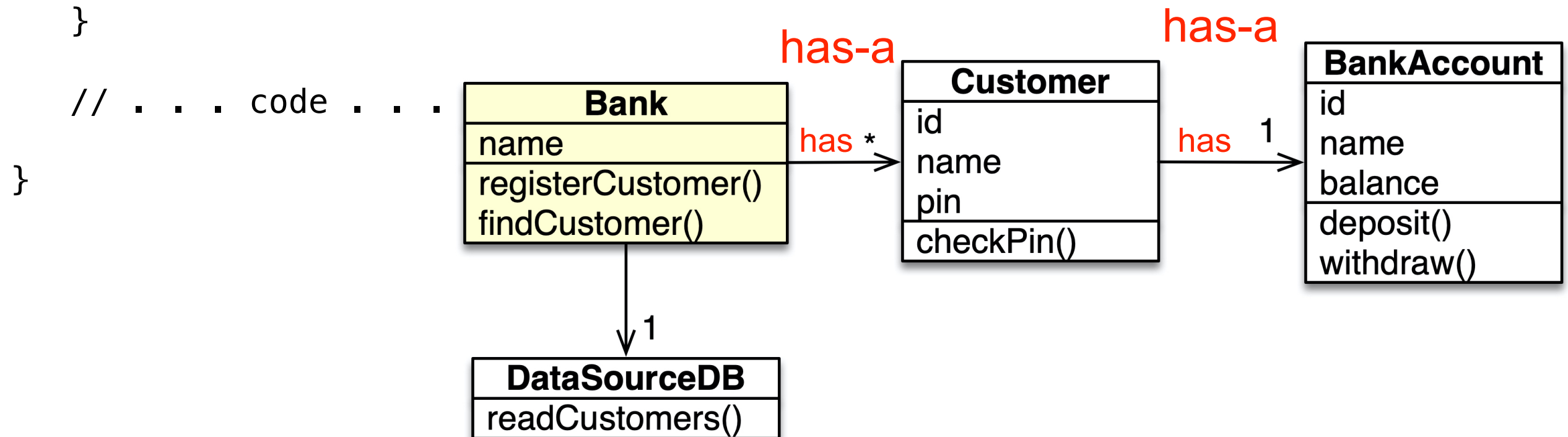
ATM Example

DataSourceDB
readCustomers()

```
public class DataSourceDB {  
    public Map<Integer, Customer> readCustomers() {  
        // . . . code . . .  
    }  
}
```

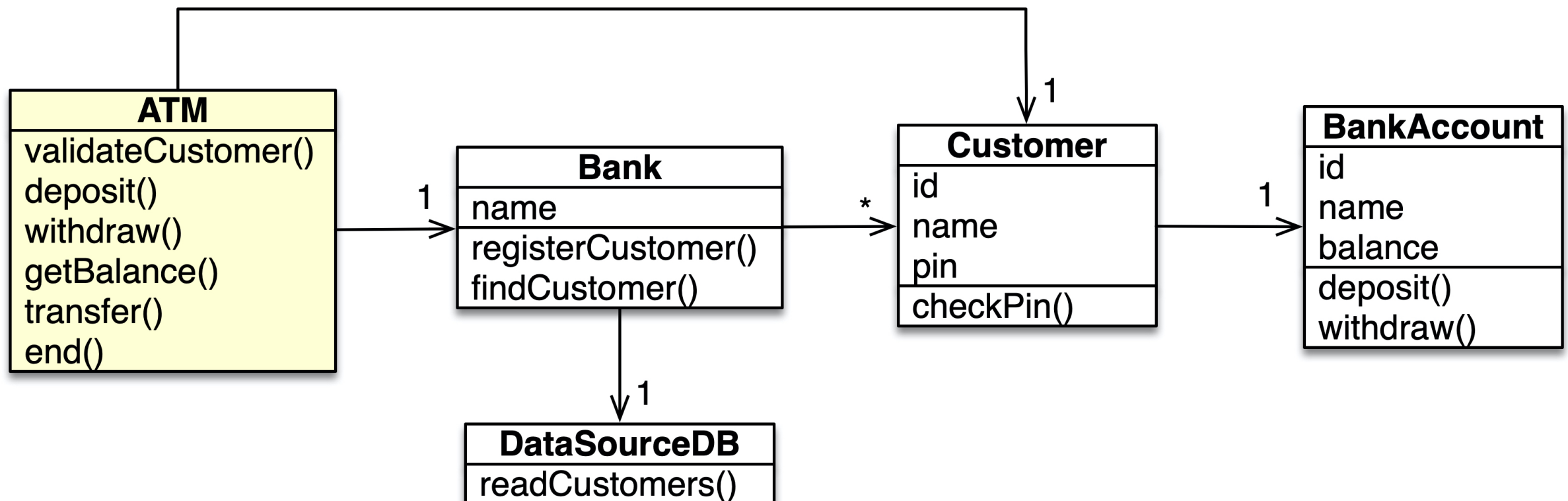
ATM Example

```
public class Bank {  
  
    private String name  
    private Map<Integer, Customer> customers;  
    private DataSourceDB dataSource;  
  
    public Bank(String name) {  
        this.name = name;  
        this.dataSource = new DataSourceDB();  
        this.customers = dataSource.readCustomers();  
    }  
  
    // . . . code . . .  
}
```



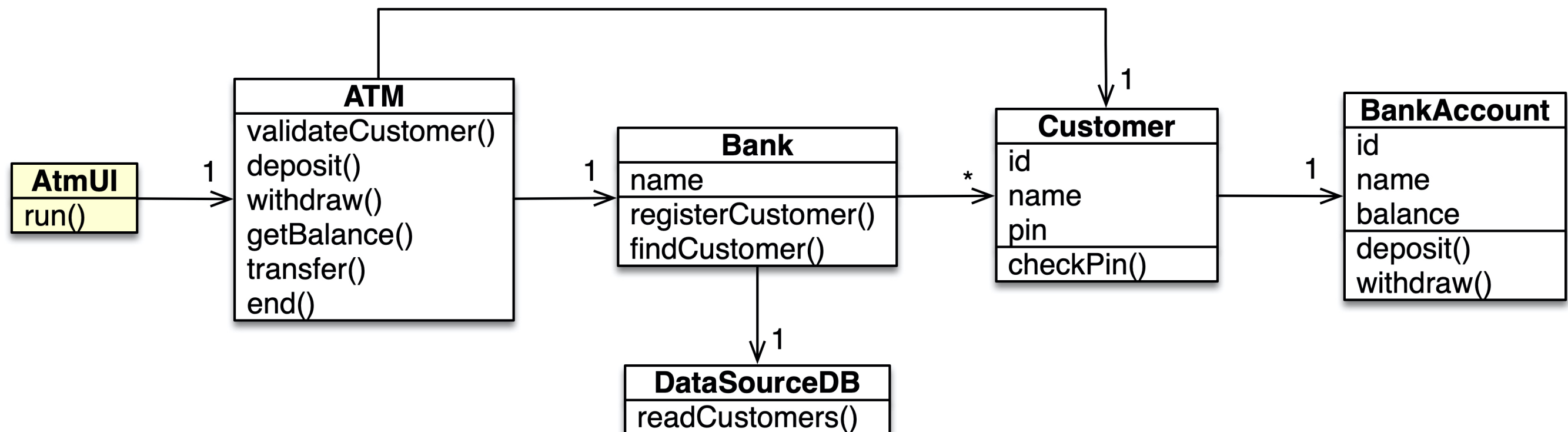
ATM Example

```
public class ATM {  
    private Bank bank;  
    private Customer loginCustomer;  
  
    public ATM() {  
        this.bank = new Bank();  
        this.loginCustomer = null;  
    }  
  
    // . . . code . . .  
}
```



ATM Example

```
public class AtmUI {  
  
    private ATM atm;  
  
    public AtmUI() {  
        this.atm = new ATM();  
    }  
  
    // . . . code . . .  
}
```



ATM Example

```
public class Main {  
    public static void main(String[] args) {  
        AtmUI atmUI = new AtmUI();  
        atmUI.run();  
    }  
}
```