Lesson 2 (extra) Bad solutions in Object Oriented Design

Software Analysis and Design

2nd Year, Computer Science

Universidad Autónoma de Madrid

Object Orientation

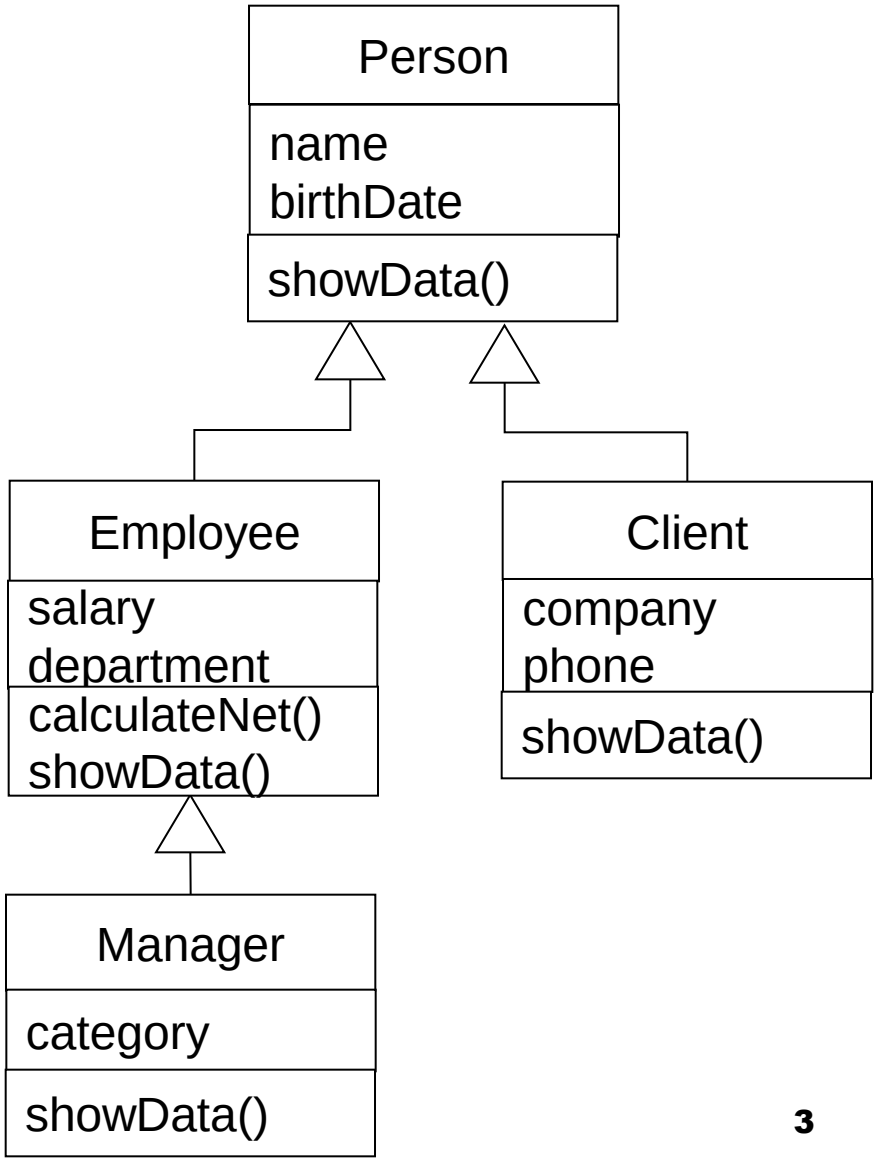
Advantages

- Models real-world concepts in a natural way
- Design extensibility
  - By means of inheritance: add new classes, extend method behaviour
  - By means of encapsulation: the source code that a class uses cannot be based on unnecessary details
- Promotes reuse

Example

Behaviour specialization

- Employee.showData() shows in addition salary and department.
- Manager.showData() shows in addition the category
- These two methods add extra code to the methods of the parent class



Other solutions …

Person
name birthDate
showData()

Employee
name birthDate salary department
calculateNet() showData()

Client
name birthDate company phone
showData()

Manager
name birthDate salary department category
showData()

Other *WORSE solutions*

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- showData() in each of the 4 classes needs repeated code to show name and birthData (attributes common to all)

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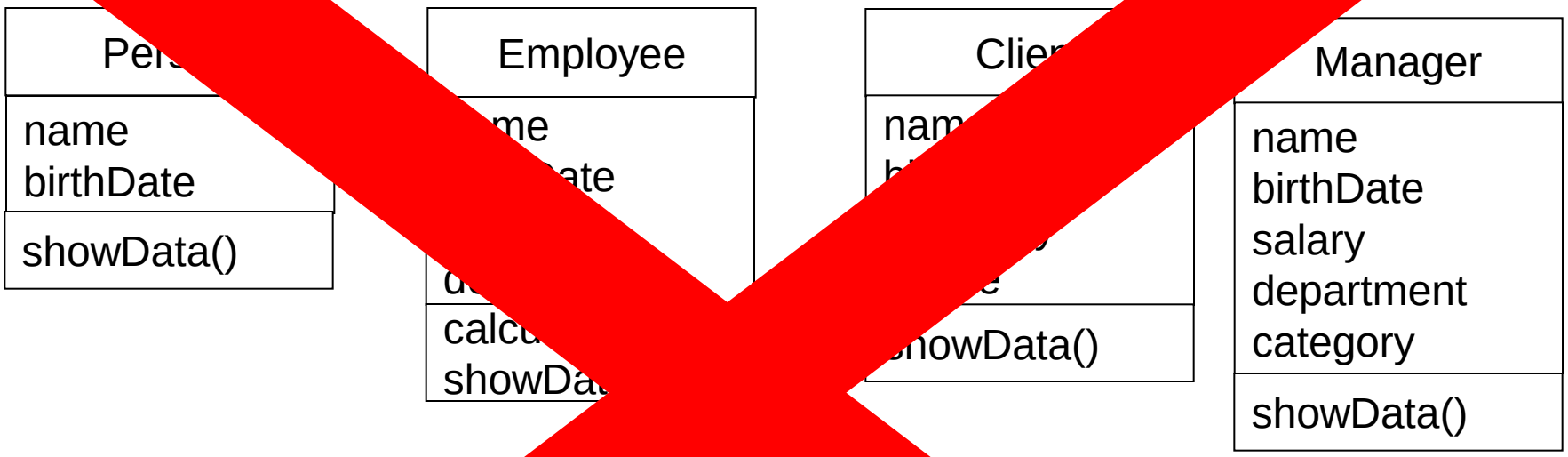
- What happens if we want to have an array of any kind of Person?

Other *WORSE solutions*



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Other *WORSE solutions*

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showData() calculateNet()

- **personType** is a flag that distinguishes if the object is a Person, Employee, Manager or Client

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  - Clients do not need salary, department or category
  - …

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- **personType** is a flag that distinguishes if the object is a Person, Employee, Manager or Client
- Objects contain unnecessary attributes:
  - Clients do not need salary, department or category
  - …
- Method code becomes unnecessarily complicated (need to check personType before performing the actions specific to each Person type) →

Other *WORSE solutions*

Person
name birthDate salary department company phone category **personType**
showData() calculateNet()

```
public double calculateNet() {
   if (personType == Employee || personType ==  Manager)
   {
      …                    // Calculation
   }
   else { … }              // Error
}

public void showData() {
   System.out.println(name + ", " + birthDate);
   if (personType == Client) {
      //…
   }
   else if (personType == Employee) {
      // …
   }
   // …
}
```

Other *WORSE solutions*

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- What happens if we want to add a new type of Employee like Collaborator (specialist in some domain) or Administrative (who can have several responsibility levels)?

Other *WORSE solutions*

Person
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- What happens if we want to add a new type of Employee like Collaborator (specialist in some domain) or Administrative (who can have several responsibility levels)?
- We need to modify all methods of Person, adding the corresponding “ifs”
- We need to add attributes to Person (speciality, level, …)

- Modifying existing code to add new functionality is error-prone and makes the extension difficult

Other *WORSE solutions*

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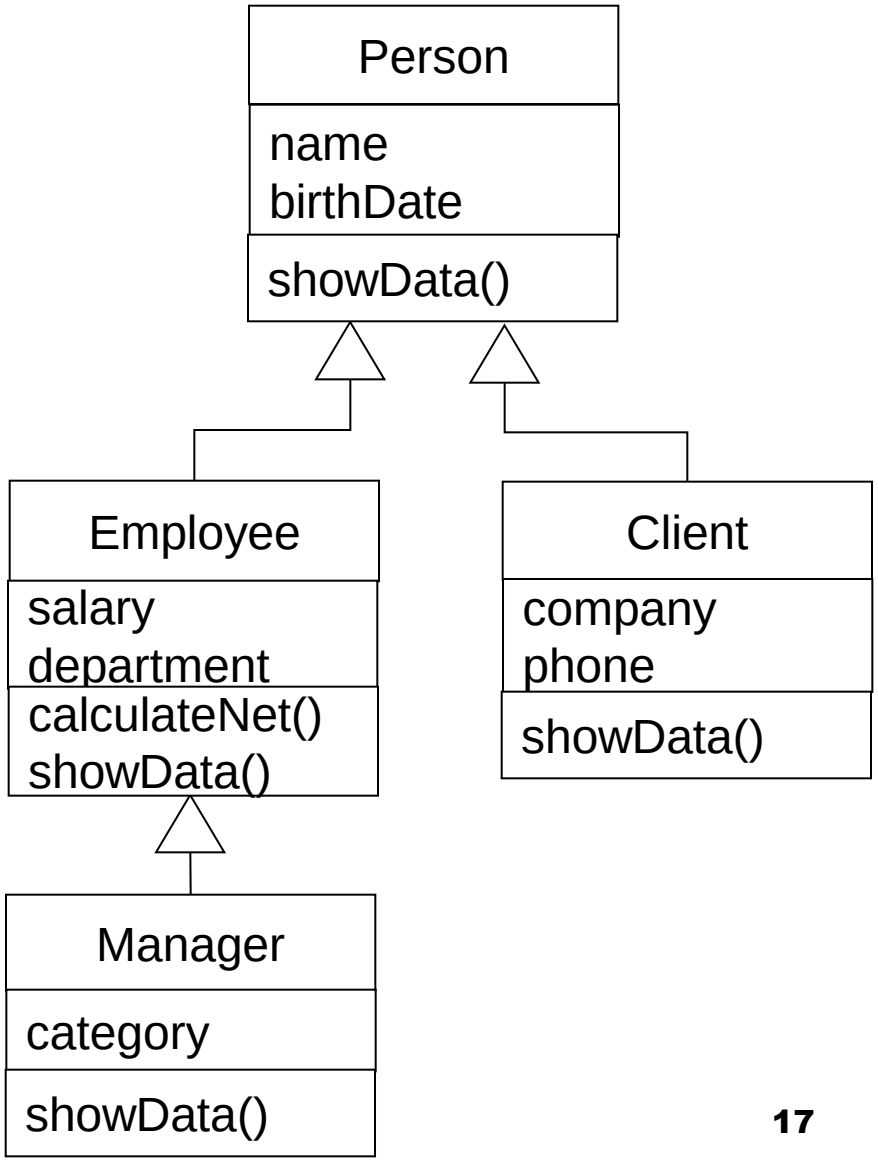
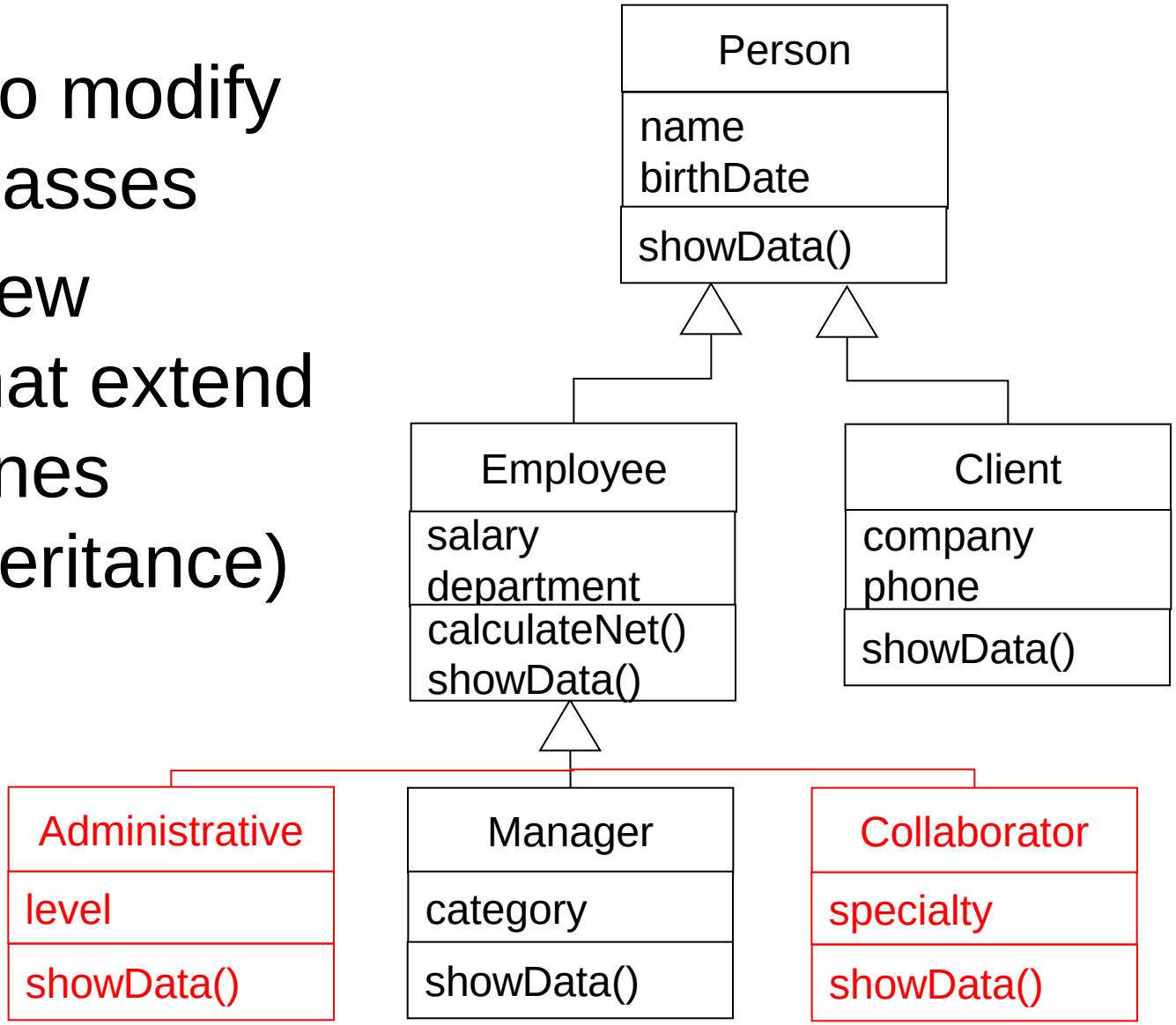


Extending the example

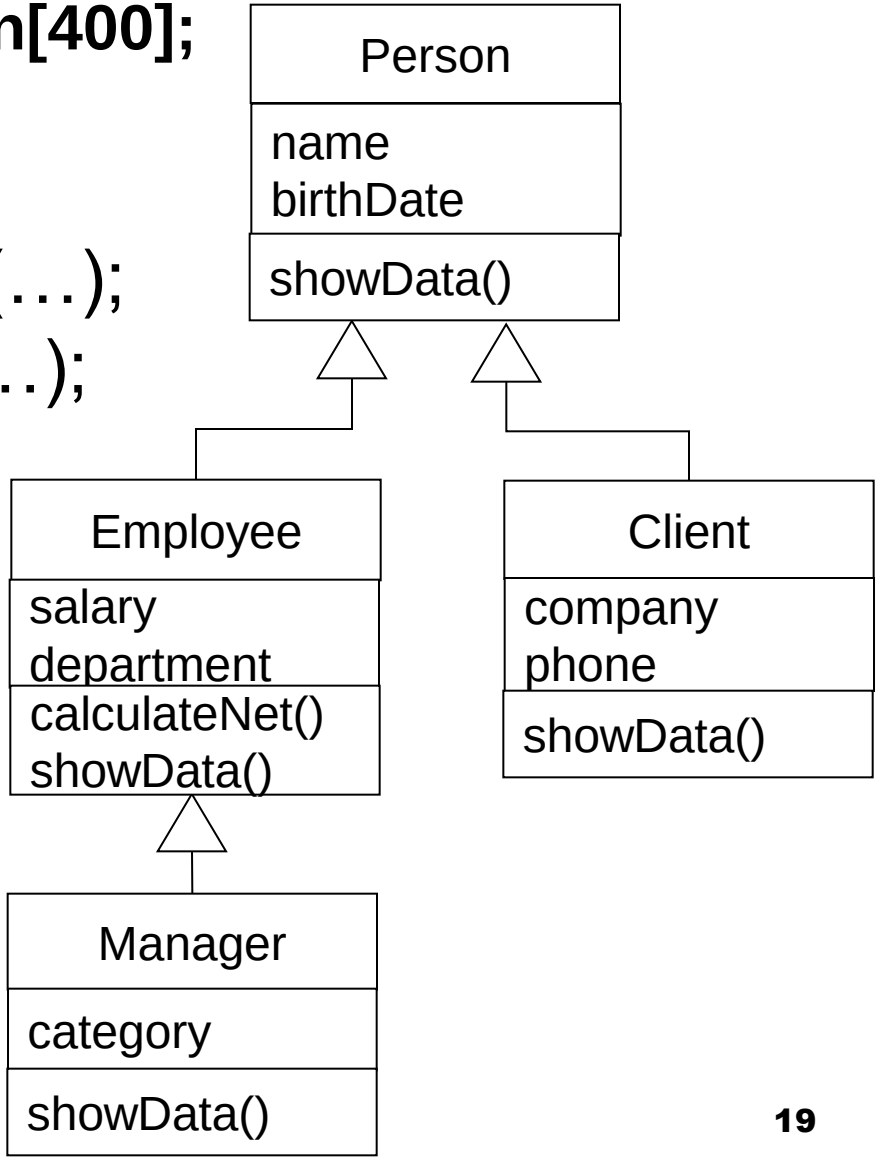
- No need to modify existing classes
- We add new classes that extend existing ones (using inheritance)



This better design allows:

Person[ ] company = new Person[400];

company[0] = new Client(…);
company[1] = new Employee(…);
company[2] = new Manager(…);



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Person[ ] company = new Person[400];

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company[0] = new Client(…);
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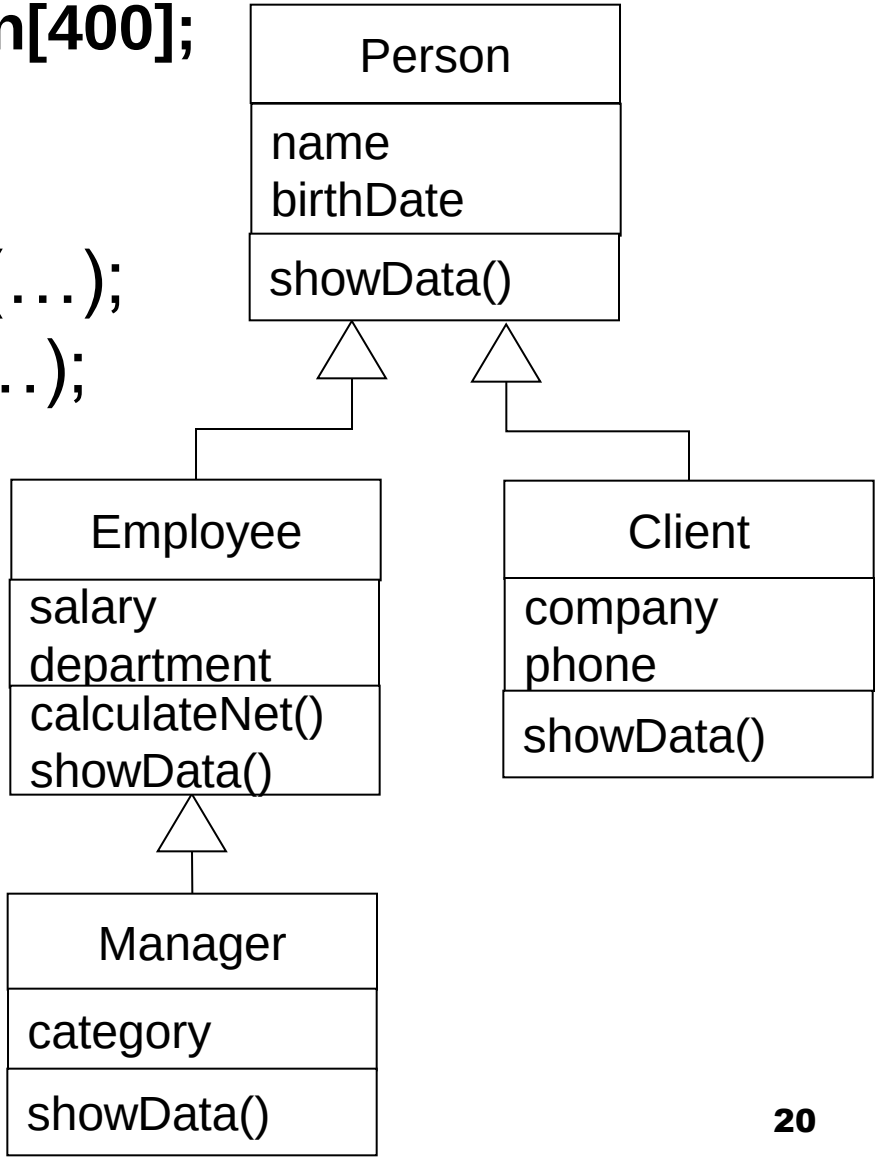
for (Person p : company) {
   p.showData();
}
```



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company[0] = new Client(…);
company[1] = new Employee(…);
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for (Person p : company) {
   p.showData();
}

// However, it does not allow:
for (Person p : company) {
   p.calulateNet();
} // Why not?
```