Advanced Software Development: Refactoring Examples

CPSC 501: Advanced Programming Techniques
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Jonathan Hudson, Ph.D
Assistant Professor (Teaching)
Department of Computer Science
University of Calgary

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Lets do something with all that

Example 1

- **Form Template Method**
  - Used when there is similar (but not identical) code in sibling classes
    - Their methods do similar steps in the same order
      - But the steps are different
  - Goal is **Template Method** design pattern
    - Identical code put into common superclass
    - Differing code put into subclasses

Example 1

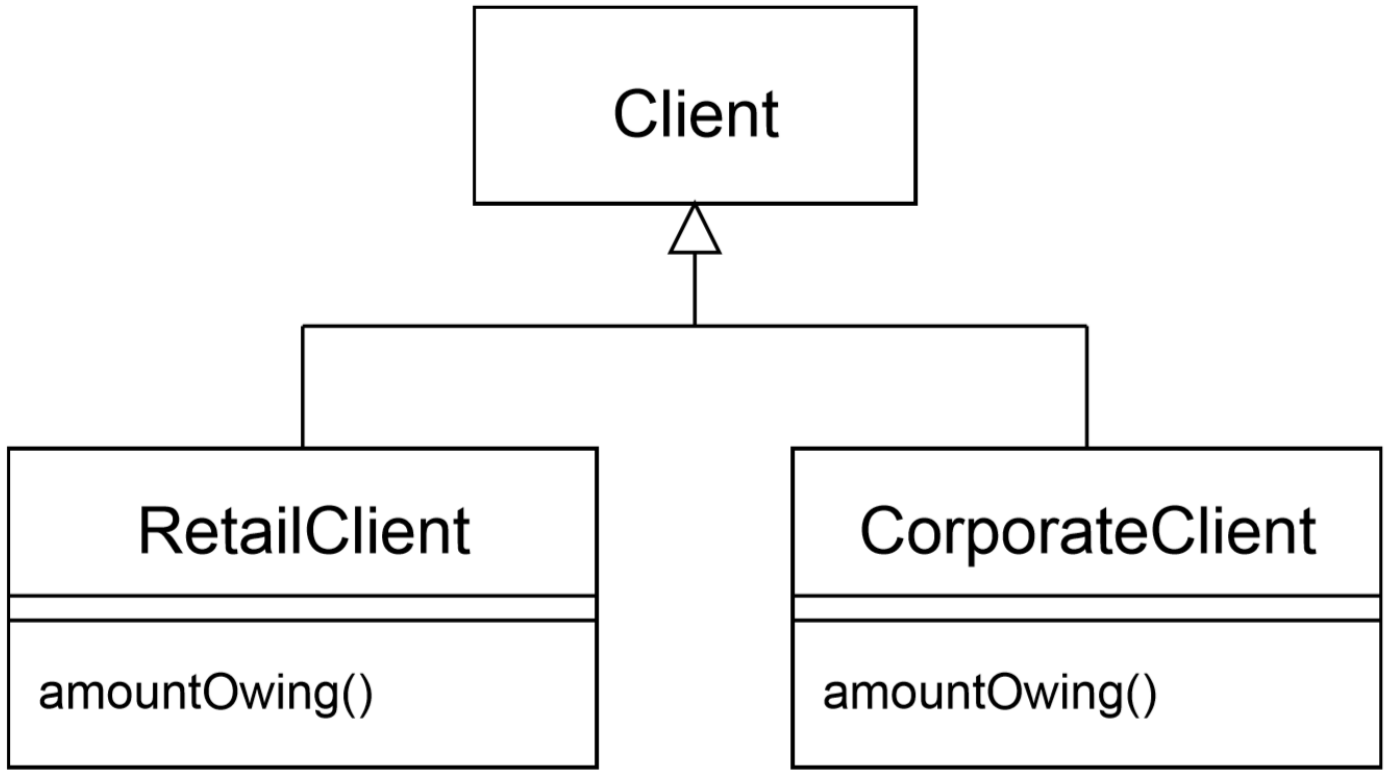
- Original code:

```
public class CorporateClient extends Client{

    public double amountOwing(int daysWorked){
        double base = retainer + (daysWorked / 30.0) * monthlyRate();
        double discount = 500.0 + base * 0.02;
        return base-discount;
    }
```

```
public class RetailClient  extends Client{

    public double amountOwing(int daysWorked){
        double base = daysWorked * dailyRate();
        double discount = base * discountRate();
        return base-discount;
    }
```

Example 1

- Original code:



Example 1

- Mechanics:
  - Extract methods that are either identical or completely different

OLD

```
public class RetailClient  extends Client{

   public double amountOwing(int daysWorked){
      double base = daysWorked * dailyRate();
      double discount = base * discountRate();
      return base-discount;
   }
```

NEW

```
public class RetailClient extends Client {

   public double amountOwing(int daysWorked) {
      double base = baseAmount(daysWorked);
      return base - discountAmount(base);
   }

   public double baseAmount(int daysWorked) {
      return daysWorked * dailyRate();
   }

   public double discountAmount(double base) {
      return base * discountRate();
   }
```

Example 1

OLD

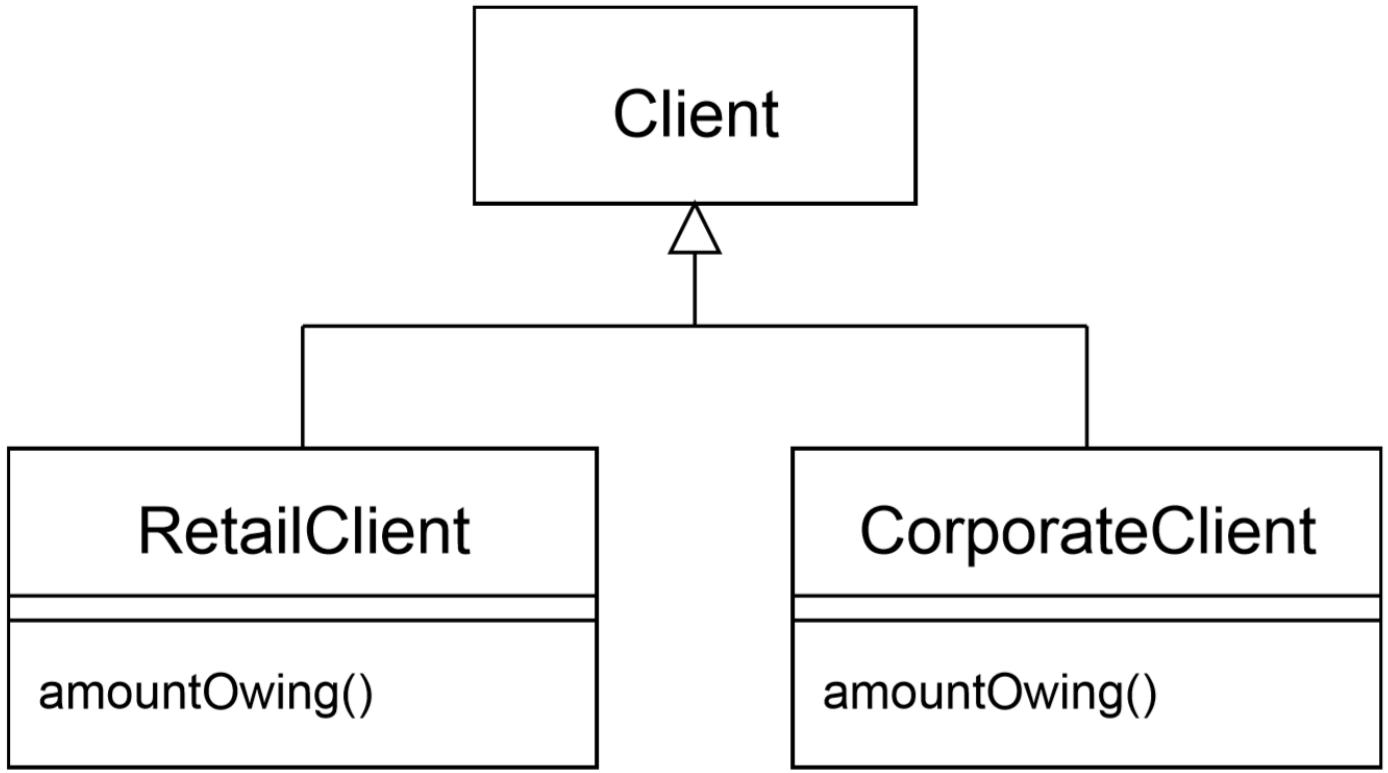
```
public class CorporateClient extends Client{

   public double amountOwing(int daysWorked){
         double base = retainer + (daysWorked / 30.0) * monthlyRate();
         double discount = 500.0 + base * 0.02;
         return base-discount;
      }
```

NEW

```
public class CorporateClient extends Client {

   public double amountOwing(int daysWorked) {
      double base = baseAmount(daysWorked);
      return base - discountAmount(base);
   }

   public double baseAmount(int daysWorked) {
      return retainer + (daysWorked / 30.0) * monthlyRate();
   }

   public double discountAmount(double base) {
      return 500.0 + base * 0.02;
   }
```

Example 1

- Original code:



Example 1

- Pull up the common method into the superclass, and declare differing methods as abstract

```
public class CorporateClient extends Client {

   public double amountOwing(int daysWorked) {
      double base = baseAmount(daysWorked);
      return base - discountAmount(base);
   }

   public double baseAmount(int daysWorked) {
      return retainer + (daysWorked / 30.0) * monthlyRate();
   }

   public double discountAmount(double base) {
      return 500.0 + base * 0.02;
   }
```

```
public class RetailClient extends Client {

   public double amountOwing(int daysWorked) {
      double base = baseAmount(daysWorked);
      return base - discountAmount(base);
   }

   public double baseAmount(int daysWorked) {
      return daysWorked * dailyRate();
   }

   public double discountAmount(double base) {
      return base * discountRate();
   }
```

Example 1

- Pull up the common method into the superclass, and declare differing methods as abstract

```
public abstract class Client {
   public double amountOwing(int daysWorked) {
      double base = baseAmount(daysWorked);
      return base - discountAmount(base);
   }

   public abstract double baseAmount(int daysWorked);

   public abstract double discountAmount(double base);
}
```

Example 1

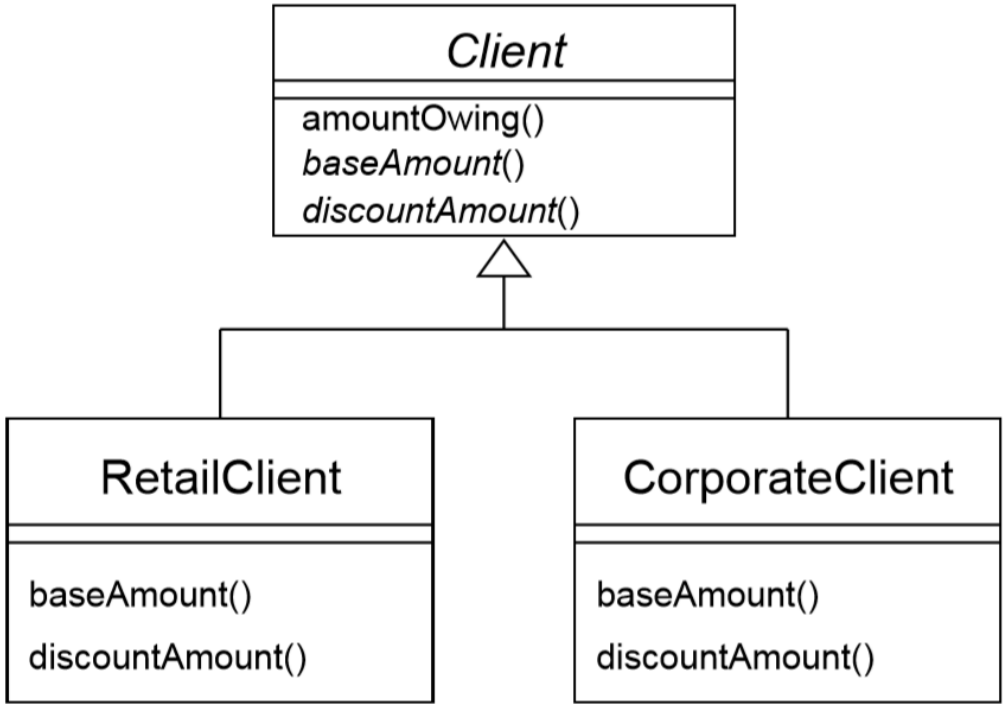
- Remove pulled up methods from subclasses

```
public class CorporateClient extends Client {

   public double baseAmount(int daysWorked){
      return  retainer + (daysWorked / 30.0) * monthlyRate();
   }

   public double discountAmount(double base){
      return 500.0 + base * 0.02;
   }
```

```
public class RetailClient  extends Client {

   public double baseAmount(int daysWorked){
      return daysWorked * dailyRate();
   }

   public double discountAmount(double base){
      return base * discountRate();
   }
```

Example 1

- Result



Example 1

- Now easy to add new kinds of Clients
  - Create a new concrete subclass, overriding the abstract methods

How about something else

Example 2

- **Replace Type Code with Subclasses**
  - Allows you to remove switch statements, if followed by **Replace Conditional with Polymorphism**

Example 2

- Original code:

```
public class Account {

   static final int SAVINGS = 0;
   static final int CHEQUING = 1;

   private final int type;

   public Account(int typeCode) {
      type = typeCode;
   }

}
```

Example 2

- Mechanics
  - Self-encapsulate the type code
    - If used by the constructor, replace constructor with factory method

```
public class Account {
   static final int SAVINGS = 0;
   static final int CHEQUING = 1;
   private final int type;

   private Account(int typeCode) {
      type = typeCode;
   }
   public static Account create(int typeCode) {
      return new Account(typeCode);
   }
   public int getType() {
      return type;
   }
}
```

Example 2

- For each type code, create a subclass
  - Override the getType() method
  - Change the factory method

```
public class Chequing extends Account {
   public Chequing() {
      super(Account.CHEQUING);
   }

   public int getType() {
      return Account.CHEQUING;
   }
}
```

```
public class Savings extends Account {
   public Savings() {
      super(Account.SAVINGS);
   }

   public int getType() {
      return Account.SAVINGS;
   }
}
```

Example 2

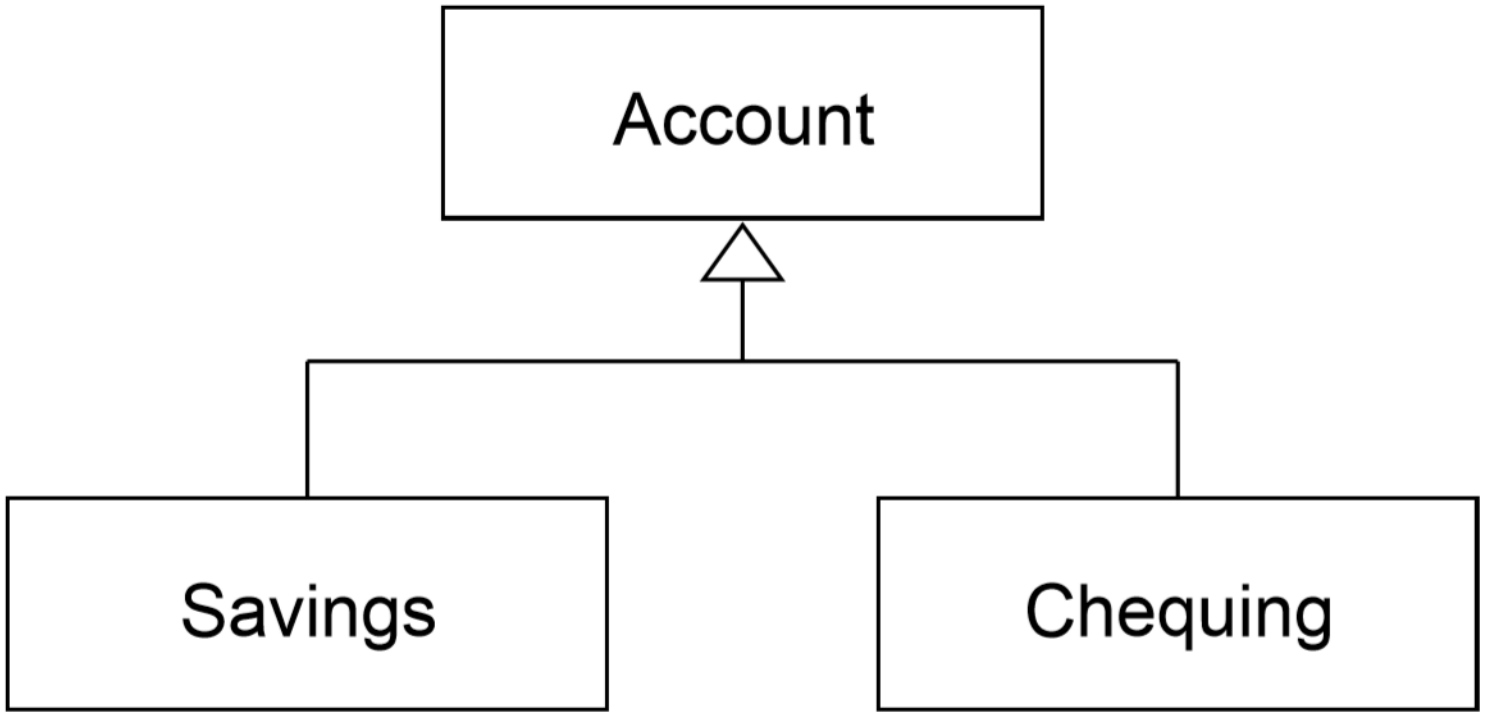
```
public class Account {

   static final int SAVINGS = 0;
   static final int CHEQUING = 1;

   private final int type;

   protected Account(int typeCode) {
      type = typeCode;
   }

   public static Account create(int typeCode) {
      switch (typeCode) {
         case SAVINGS:
            return new Savings();
         case CHEQUING:
            return new Chequing();
         default:
            throw new IllegalArgumentException("Bad type code!");

      }
   }

   public int getType() {
      return type;
   }
}
```

Example 2

- Remove the type code field
  - Declare accessors as abstract

```
public abstract class Account {
   static final int SAVINGS = 0;
   static final int CHEQUING = 1;

   public static Account create(int typeCode) {
      switch (typeCode) {
         case SAVINGS:
            return new Savings();
         case CHEQUING:
            return new Chequing();
         default:
            throw new IllegalArgumentException("Bad type code!");

      }
   }

   public abstract int getType();
}
```

Example 2



Example 2

- Use **Push Down Method** and **Push Down Field** for features specific to a subclass
- If you have switch statements in methods other than the factory method, use **Replace Conditional with Polymorphism**

Onward to …
Docker.

Jonathan Hudson
jwhudson@ucalgary.ca
https://pages.cpsc.ucalgary.ca/~jwhudson/

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