TA Session 10

Ex-6

Running your program

java MyFileScript <SourceDir> <CommandFile>

Command Line args.

Running your program

java MyFileScript <SourceDir> <CommandFile>

Command Line args.

MyFileScript **/home/myUser** **/etc/commands**

commandFile

```
FILTER
greater_than#1024
ORDER
abs
FILTER
between#2#512
ORDER
size
FILTER
smaller_than#2
ORDER
```

Output

```
big_file.txt
file2.txt
file1.txt
```

SourceDir

Name	Date modified	Type	Size
big_file.txt	17/05/2014 14:57	Text Document	1,690 KB
file1.txt	17/05/2014 14:57	Text Document	310 KB
file2.txt	17/05/2014 15:01	Text Document	4 KB

What would be the Different **Components** of such a System?

Parsing

Filters

What would be the Different **Components** of such a System?

Orders

Section

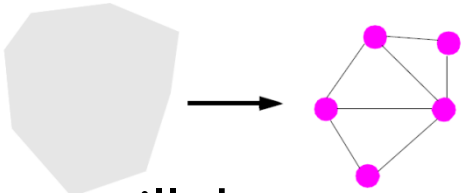
Manager

Different Components

- The exercise definition imposes implementing several different components
  - File parsing, filters/orders, different sections, etc.
- A good design would find a way to divide the task into sub-tasks that are **independent** of one another
- We will build each of these sub-tasks as a different **module**

Modules

- Each of these modules will be independent of one another
  - **Decomposability**



- Each of the modules will be easy to understand without having to know the other modules
  - **Understandability**

- A small change in one module will have a minimal effect on other modules
  - **Modular Continuity**

What do we mean by **Module?**

The different Modules

Parsing Module

- Generates the logical representation of the command files
  - The different sections, different filters and orders, etc.

- **The only** module that knows the logical order of the *commands file*
  - A change in the file structure affects this module only
  - **Modular Continuity**

The different Modules

Parsing Module

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The different Modules

Parsing Module

- Generates the logical representation of the command files
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- **The only** module that knows the logical order of the *commands file*
  - A change in the file structure affects this module only
  - **Modular Continuity**

Sections

- The *commands file* is composed of different sections
- Each section has its own set of filters/orders.
- It thus makes sense to make a module that represents each section
  - Each section **composes** the different filter/order objects
  - Sections are created by the parsing module

Sections cont.

- The section module is independent of the other modules
- It does not know of the *commands file* format
- It does not know of the specific filters/orders
  - Nor does it know their names
  - It works with the general API

The different Modules

Filters Module

- The different filters share a few common features
  - Each filter receives a file and determines whether or not it meets some condition
- It makes sense to consider them as the same module

Filters

Take 1

- Most filters could be implemented using a few lines of code at most

- Solution 1:
  - Put all filters in the same file
  - Build a small method for each of the filters

```java
protected boolean isFilePassFilter(String name, String value, String value2, File f)
                                                    throws FilterNotFoundException{
    if (name.equals("greater_than")) {
        return isGreaterThan(value,f);
    }else if (name.equals("between")) {
        return isBetween(value,value2,f);
    } else if (name.equals("smaller_than")) {
        return isSmallerThan(value,f);
    }

    throw new FilterNotFoundException(name);
}

public boolean isGreaterThan(String value, File f){
    return false;
}
public boolean isBetween(String value, String value2, File f){
    return false;
}
public boolean isSmallerThan(String value, File f){
    return false;
}
```

Filters

Take 1 – Pros & Cons

- Pros:
  - Compact
  - Requires a single file only
- Cons:
  - Adding a new filter requires modifying a working file
    - Breaks the **open/closed** principle
  - Future filters might be more complex and require more than a few lines of code
    - Single file will become large and hard to maintain

Filters

Take 1 – Pros & Cons

- Pros:
  - Compact
  - Requires a single file only

"Entity can allow its behaviour to be modified without altering its source code"

- Cons:
  - Adding a new filter requires modifying a working file
    - Breaks the **open/closed** principle
  - Future filters might be more complex and require more than a few lines of code
    - Single file will become large and hard to maintain

Filters

Take 2

- **Implement each filter in its own class**
  - Adding a new filter requires modifying only 1-2 classes
  - **Open/closed principle**
- Create a hierarchy of filters
  - Filters that share a functionality can have a common parent
    - size filters, etc.
- Super filter is an **interface**

```java
public boolean isFilePassFilter(Filter filter, File f) {
    return filter.isPass(f);
}


public class GreaterThanFilter implements Filter {
    public boolean isPass(File f) {
        return false;
    }
}
public class SmallerThanFilter implements Filter {
    public boolean isPass(File f) {
        return false;
    }
}
public class BetweenFilter implements Filter {
    public boolean isPass(File f) {
        return false;
    }
}
```

```java
public boolean isFilePassFilter(Filter filter, File f) {
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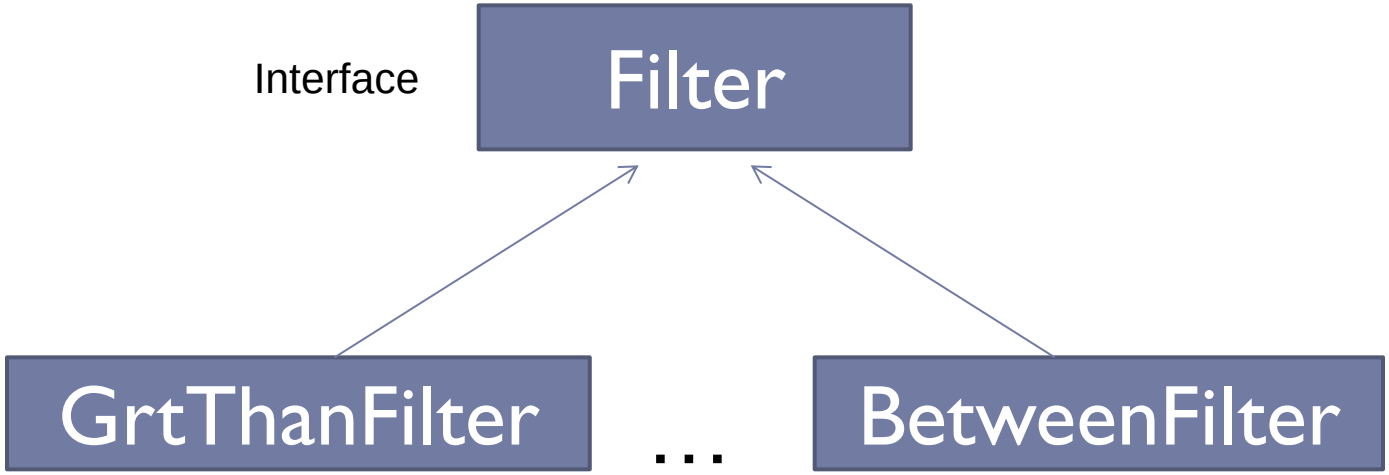
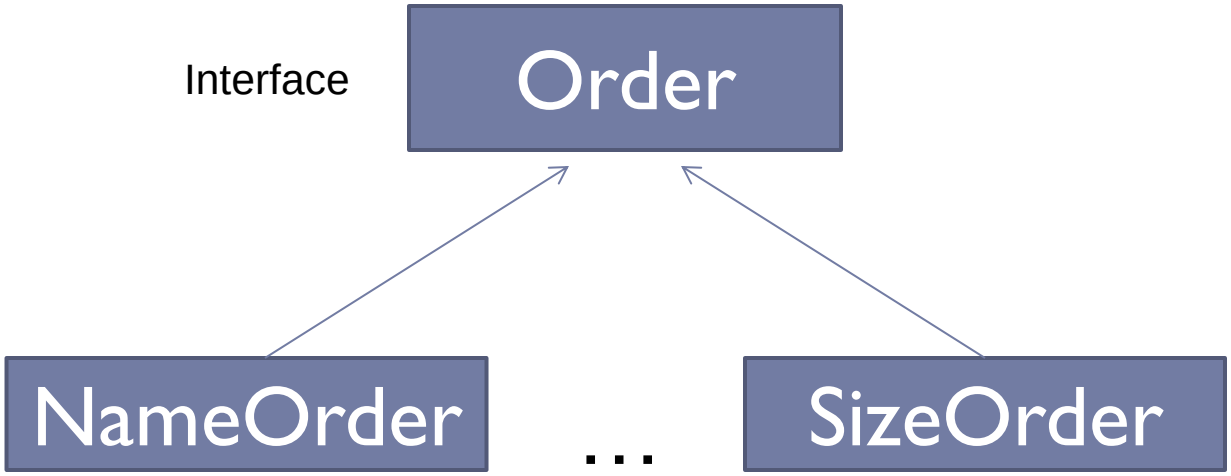
}
```

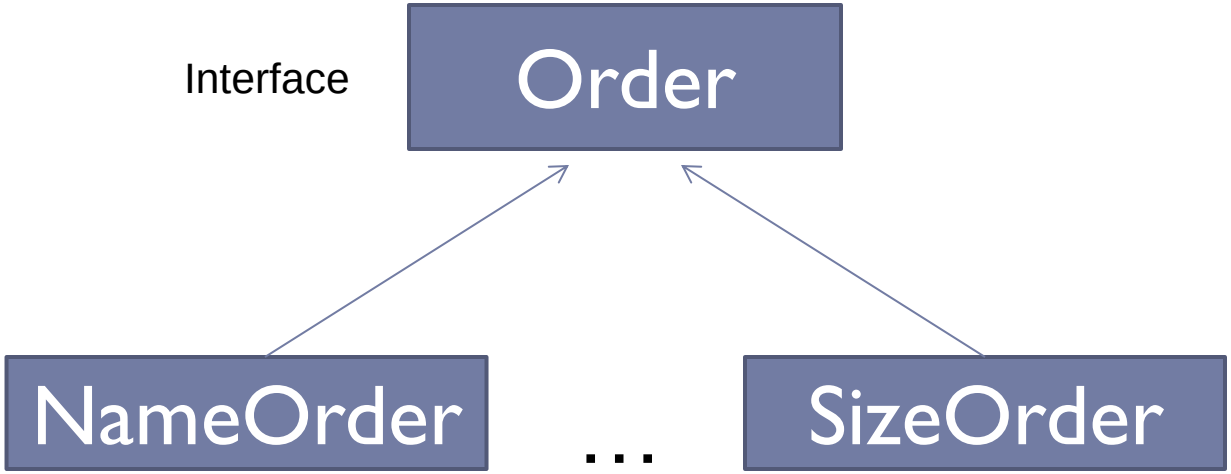

Interface
Filter
GrtThanFilter
...
BetweenFilter

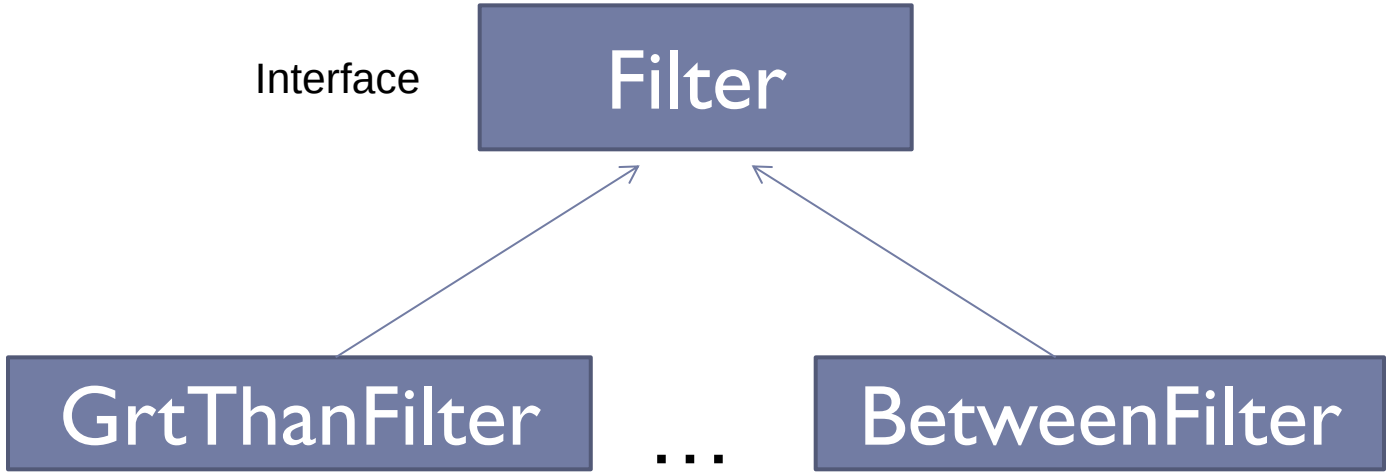
Orders

- Similarly, to provide a modular, extensible code that adheres the open/close principle we should tackle the Orders as a class hierarchy.



Who instantiates a class from those hierarchys?





Who instantiates a class from those hierarchys?

```
public Section[] parseFile(String fileName) {
    // ..
    while(moreSectionsToParse) {
        // ..
        String orderName = readLineFromFile();
        Order newOrder;

        if (orderName == "abs")
            newOrder = new AbsOrder();
        else if (orderName == "file")
            newOrder = new FileOrder();
        //..

    }

    // ..
    return sections;
}
```

Who instantiates a class from those hierarchys?

```
public Section[] parseFile(String fileName) {
    // ..
    while(moreSectionsToParse) {
        // ..
        String orderName = readLineFromFile();
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        if (orderName == "abs")
            newOrder = new AbsOrder();
        else if (orderName == "file")
            newOrder = new FileOrder();
        //..

    }

    // ..
    return sections;
}
```

Not Modular. Creates dependency between Parsing and Orders modules.

The “Factory” Design Pattern

- A **creational** design pattern

```
public class FilterFactory {
   public static Filter createFilter(String filterString) {
      if (filterString.equals("greater_than")) {
                  return new GreaterThanFilter();
      }else if(filterString.equals(“smaller_than"))
                  return new SmallerThanFilter();
      }…
   }
}
```

The “Factory” Design Pattern

- A **creational** design pattern

```
public class FilterFactory {
    public static Filter createFilter(String filterString) {
        if (filterString.equals("greater_than")) {
                    return new GreaterThanFilter();
        }else if(filterString.equals("smaller_than"))
                    return new SmallerThanFilter();
        }…
    }
}
```

The rest of the code is unaware of the concrete Filter it works with.

The “Factory” Design Pattern

```
public Section[] parseFile(String fileName) {
    // ..
    while(moreSectionsToParse) {
        // ..
        String orderName = readLineFromFile();
        Order newOrder;

        // Using the factory design pattern.
        newOrder = OrderFactory.createOrder(orderName);
        //..
    }

    // ..
    return sections;
}
```

The “Factory” Design Pattern

```
public Section[] parseFile(String fileName) {
    // ..
    while(moreSectionsToParse) {
        // ..
        String orderName = readLineFromFile();
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        // Using the factory design pattern.
        newOrder = OrderFactory.createOrder(orderName);
        //..
    }

    // ..
    return sections;
}
```

The Parsing module is unaware of the different orders.

Filters/Orders Creation

Factory

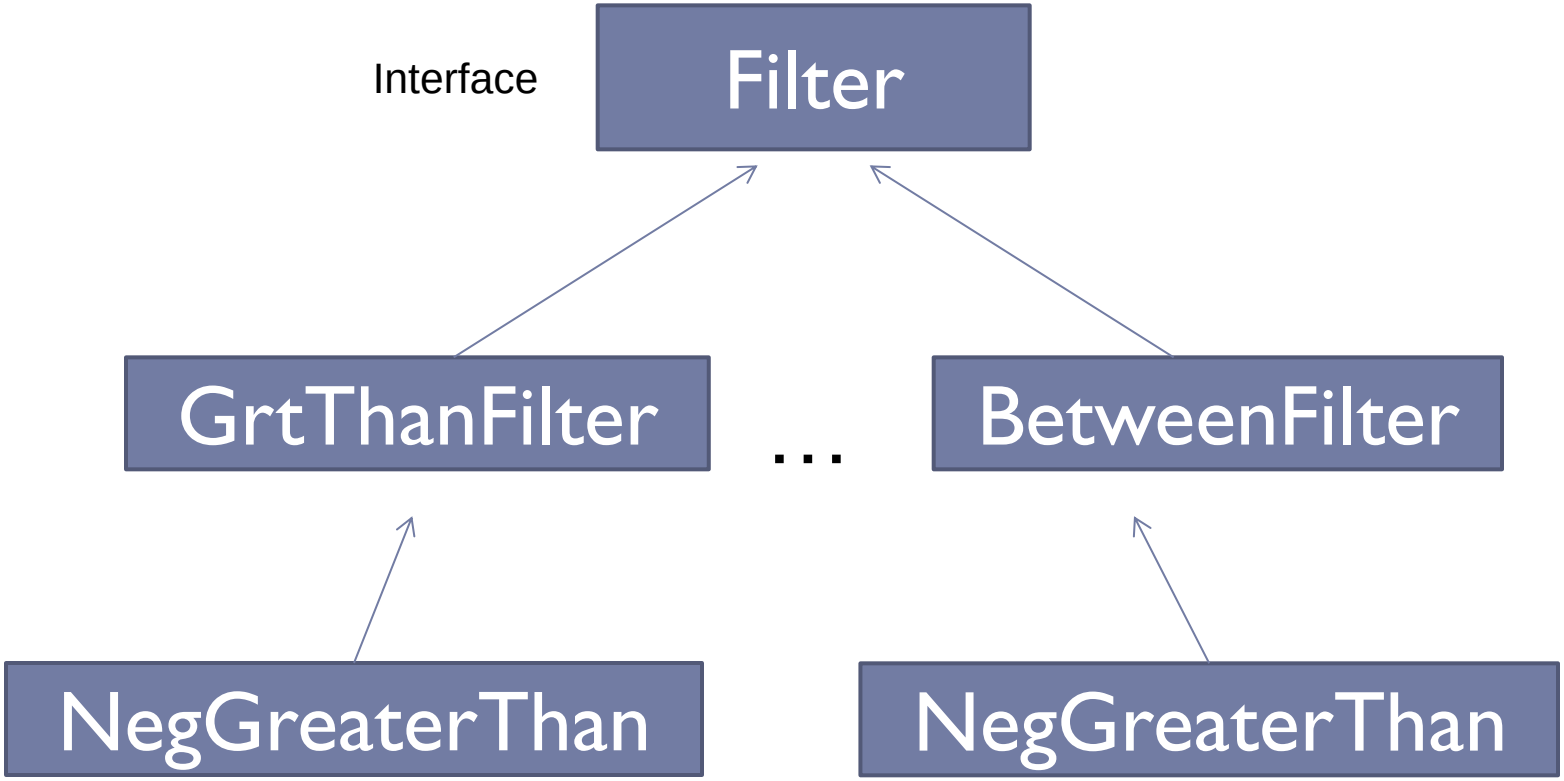
- Adding a new filter/order is confined to a single module
  - Requires adding a new class and modifying the factory class
  - The single choice principle
  - Modular continuity principle

Factory

- Important: you should **not** put all factories in the same module
  - Although they share the same design (Factory pattern), they do not share the same task, and are completely **independent** of one another
- Put factories in the same package as the objects they are generating

Negation and Reverse

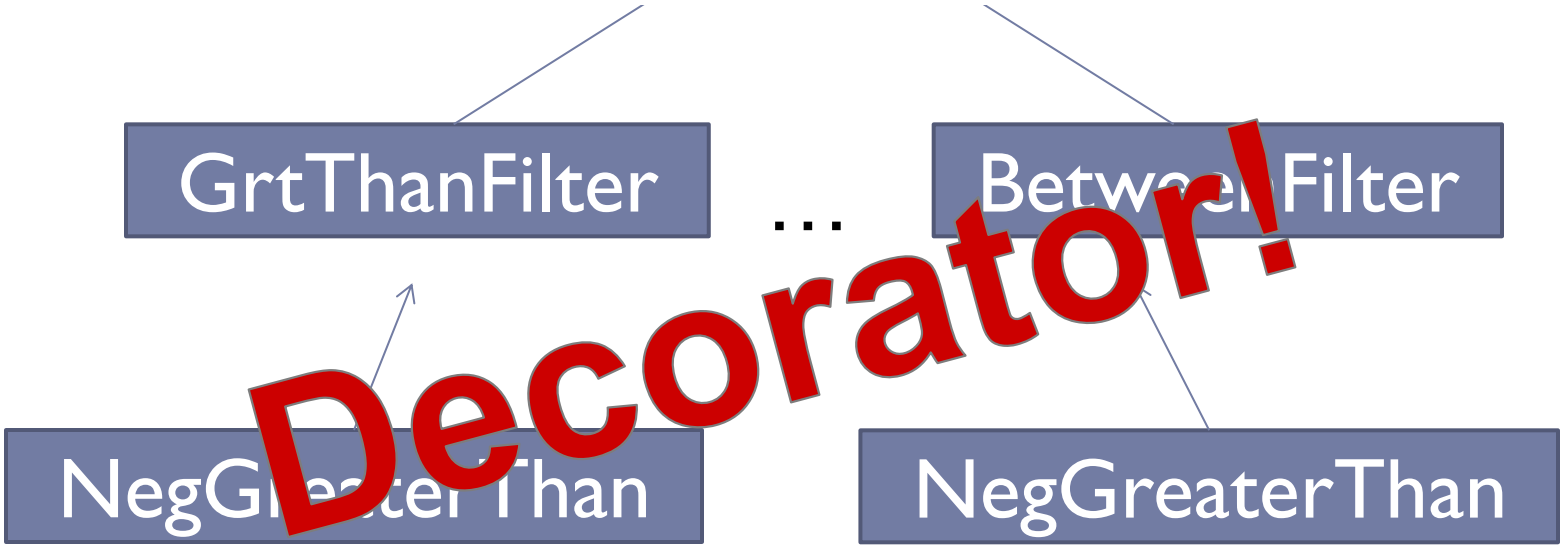
- How should we enable Negation for each of the filters ?



Negation and Reverse

- How should we enable Negation for each of the filters ?

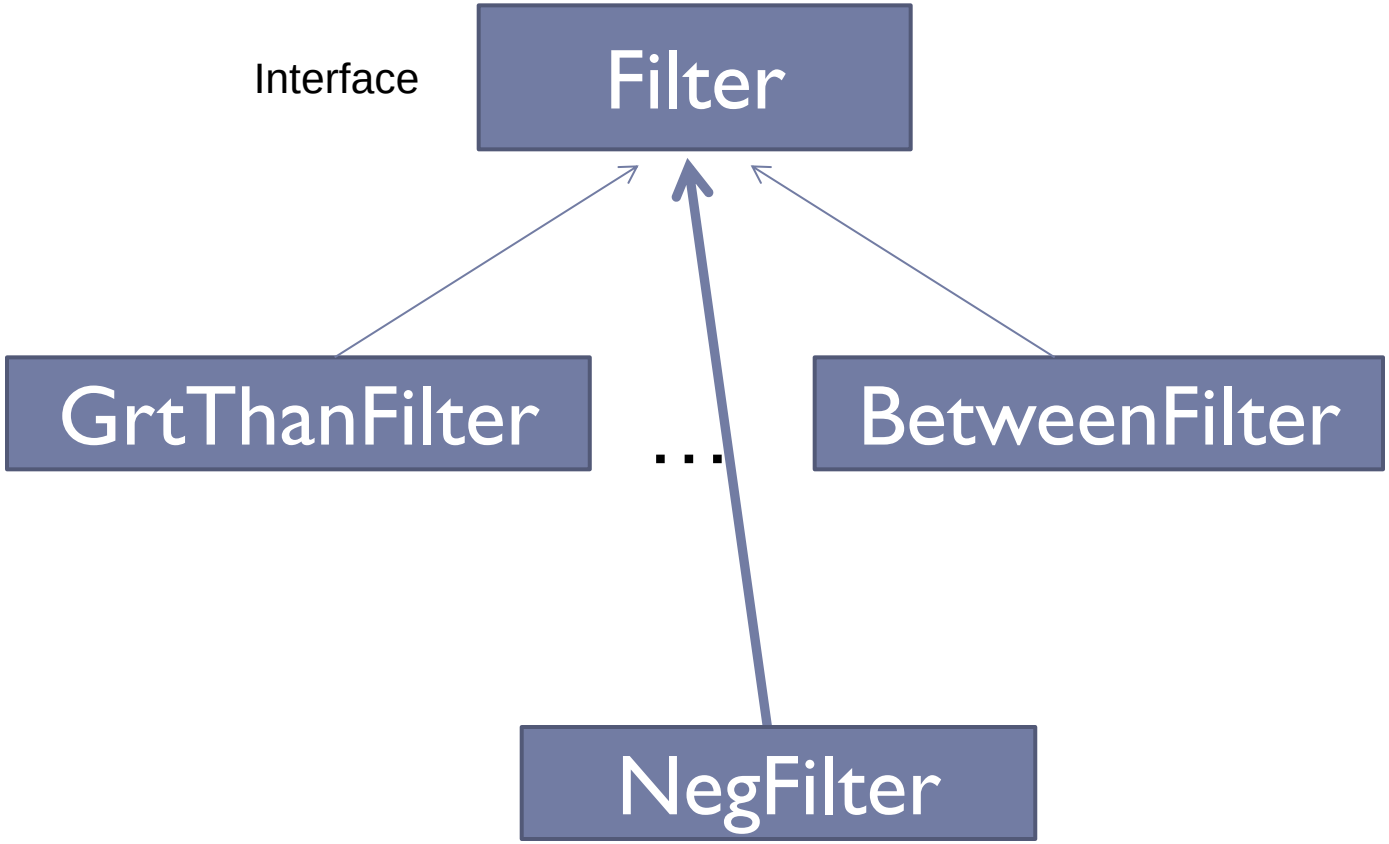
When we want to add a functionality across the class hierarchy..



Decorator!

The Decorator Design Pattern

- How should we enable Negation for each of the filters ?



The Decorator Design Pattern

```
class NegFilter implements Filter {
    private Filter internalFilter;

    public NegFilter(Filter filterToNeg) {
        internalFilter = filterToNeg;
    }

    public boolean isPass(File f) {
        // ..
        return result;
    }
}
```

Error Handling

- Exceptions are an inherent part of the problems they are built for
- As a result, exceptions should be found in the same **module** as the classes that throw them
  - E.g., **filter** exceptions should be found in the **filters** module
- Exceptions that are shared by several modules can reside in the main module

Manager

- The module that runs it all
  - Call the parsing module to parse the file
  - Iterate the different sections
    - Print warnings
    - In each section, traverse files in the *source directory*, filter them, print in the relevant order
  - Etc.

Parsing

Parsing

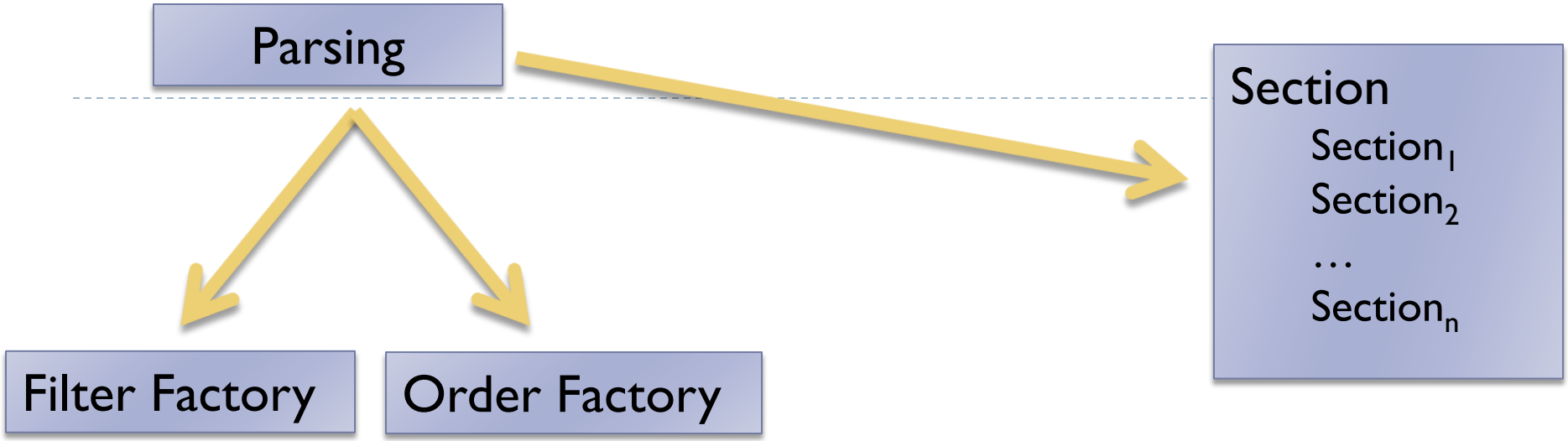
Section

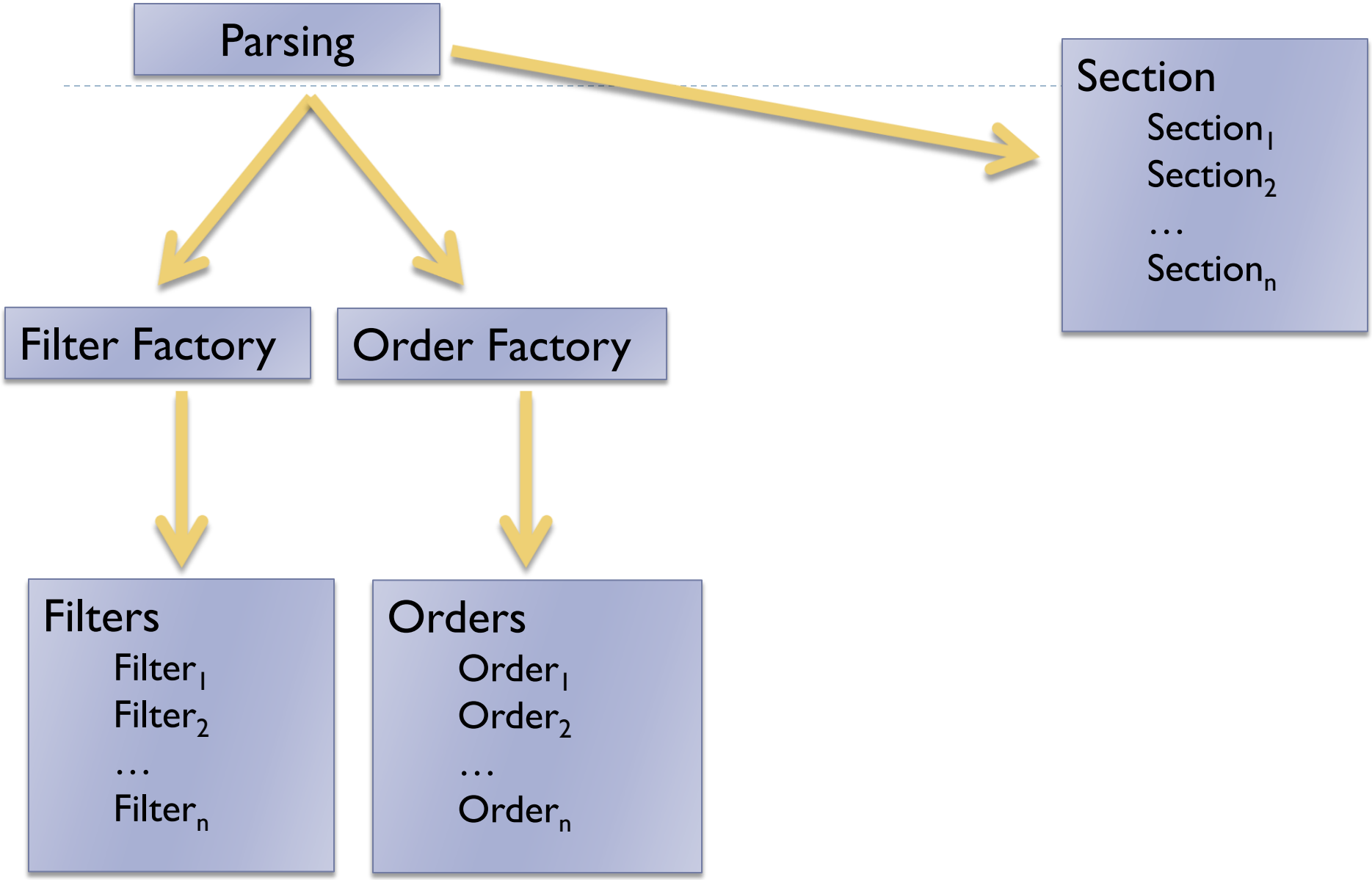
$Section_1$

$Section_2$

…

$Section_n$


Parsing
Section
Section1
Section2
…
Sectionn
Filter Factory
Order Factory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Section1
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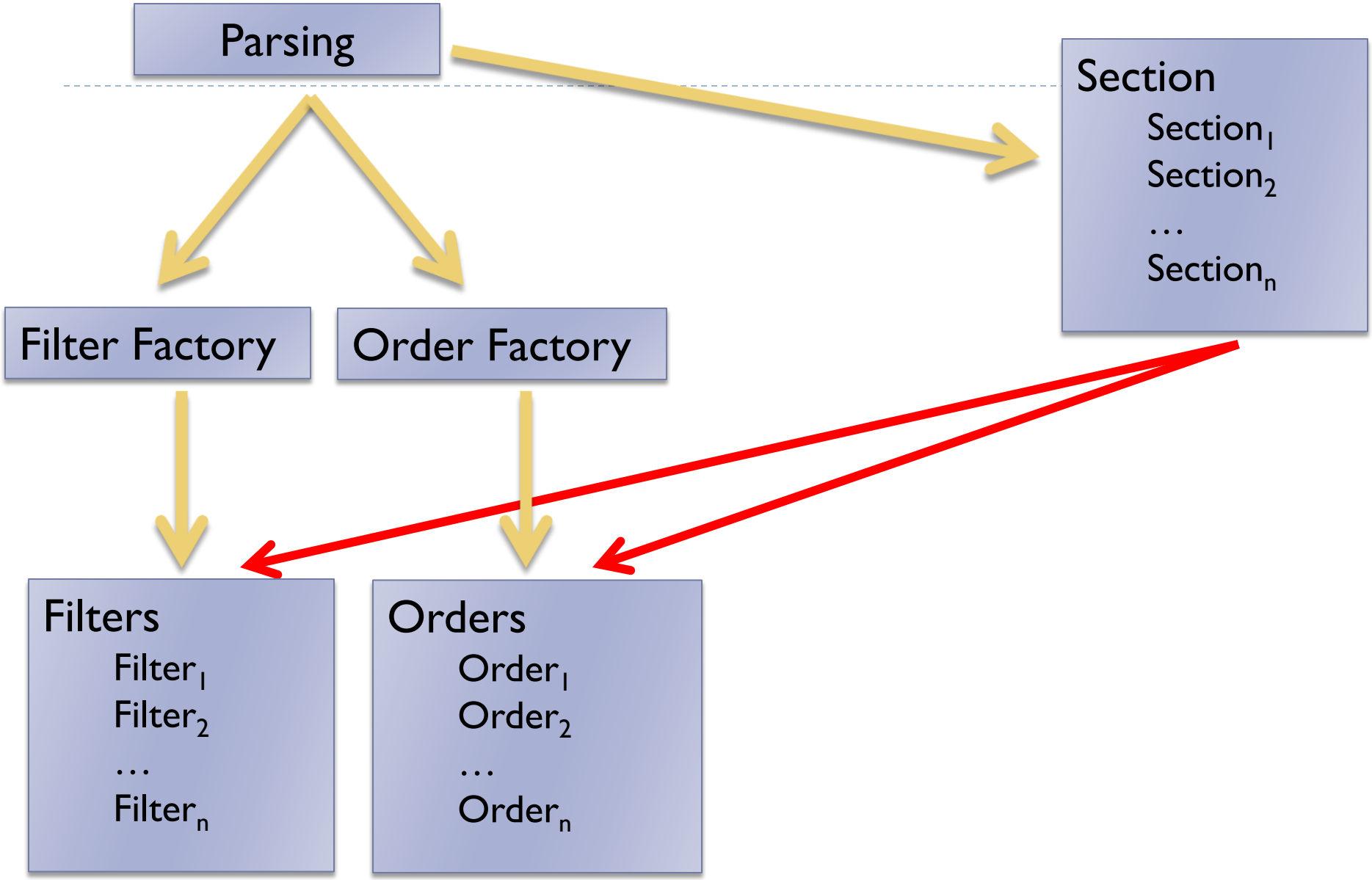
…
Sectionn
Filter Factory
Order Factory
Filters
Filter1
Filter2
…
Filtern
Orders
Order1
Order2
…
Ordern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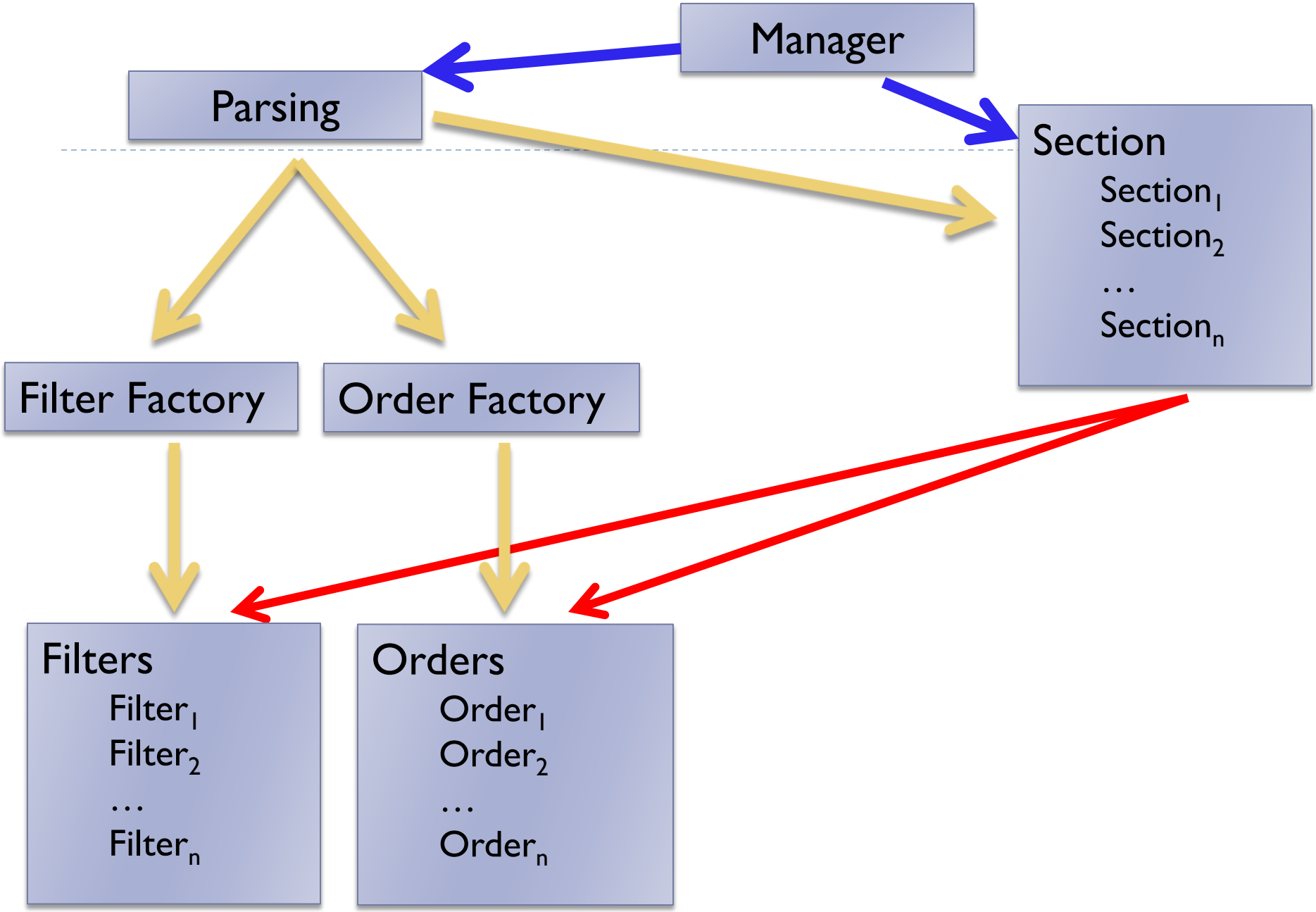
Manager
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Ordern

Static Nested Class

```
public class Person {
    private Brain internalBrain;

    private static class Eyes {
        public void captureSight(Person p) {
            p.internalBrain.processSight();
        }
    }

    public Person() {
        //..
        Eyes eyes = new Eyes();
        eyes.captureSight(this);
    }
}
```

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    public Person() {
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        Eyes eyes = new Eyes();
        eyes.captureSight(this);
    }
}
```

"With which person" do we use the eyes on ?

Static Nested Class

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public class Person {
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    private static class Eyes {
        public void captureSight(Person p) {
            p.internalBrain.processSight();
        }
    }

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        eyes.captureSight(this);
    }
}
```

Static Nested Class

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    private Brain internalBrain;

    private static class Eyes {
        public void captureSight(Person p) {
            p.internalBrain.processSight();
        }
    }
    //..
    public void meetAnotherPerson(Person personToMeet) {
        // Eyes collide
        Eyes eyes = new Eyes();
        eyes.captureSight(personToMeet);
        eyes.captureSight(this);
    }
}
```

Non-Static Nested Class: Inner Classes

```
public class Person {
    private Brain internalBrain;
    private Eyes eyes;

    private class Eyes {
        public void captureSight(Person p) {
            internalBrain.processSight();
        }
    }

    public Person() {
        eyes = this.new Eyes();
    }
}
```