CSSE 220

Object-Oriented Design
Files & Exceptions

Import *FilesAndExceptions* from the repo

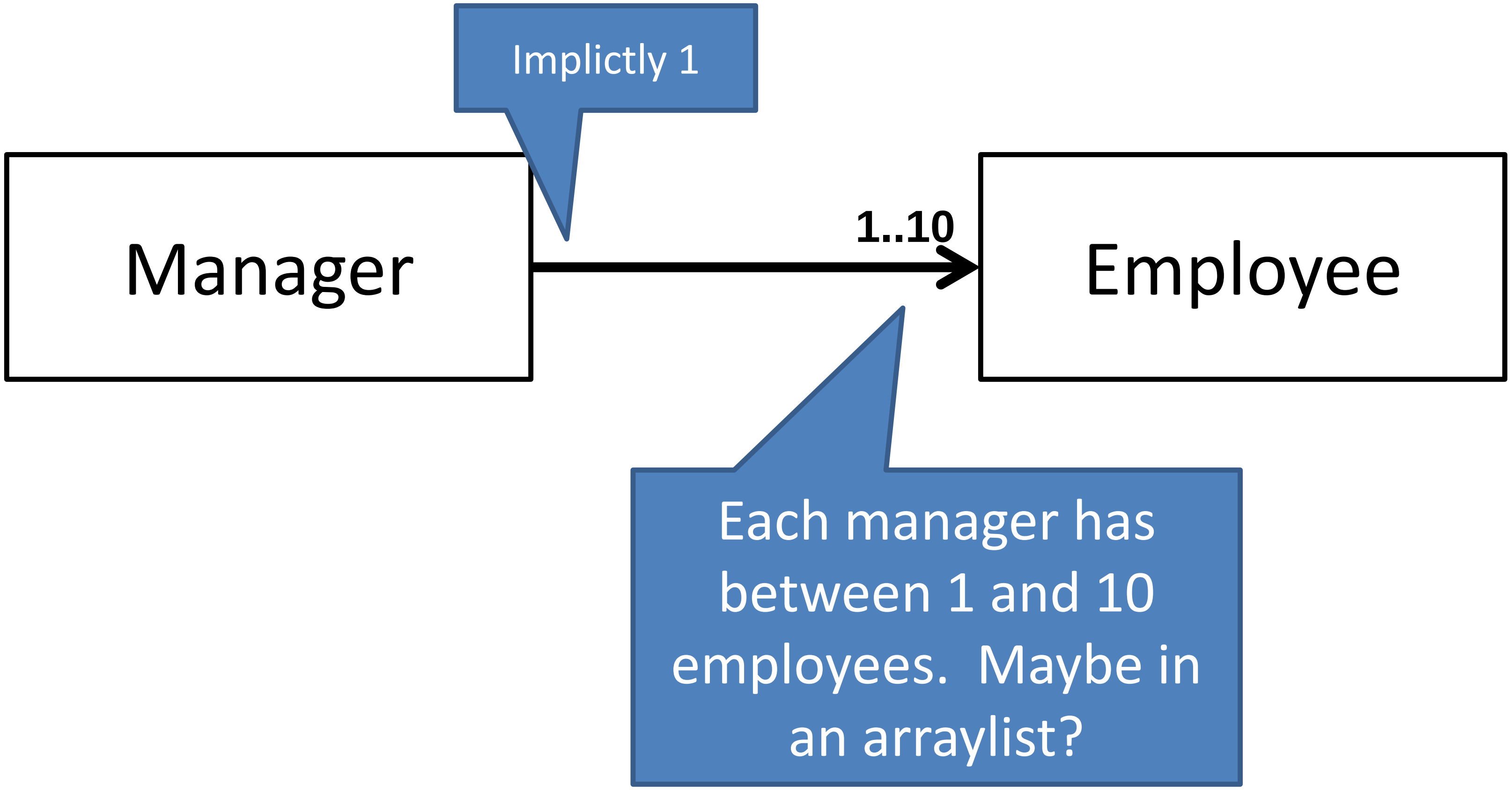
Announcements

- Take Moodle survey today to voice your preferences for project partners.
  - **Arcade Game Project Group Survey**

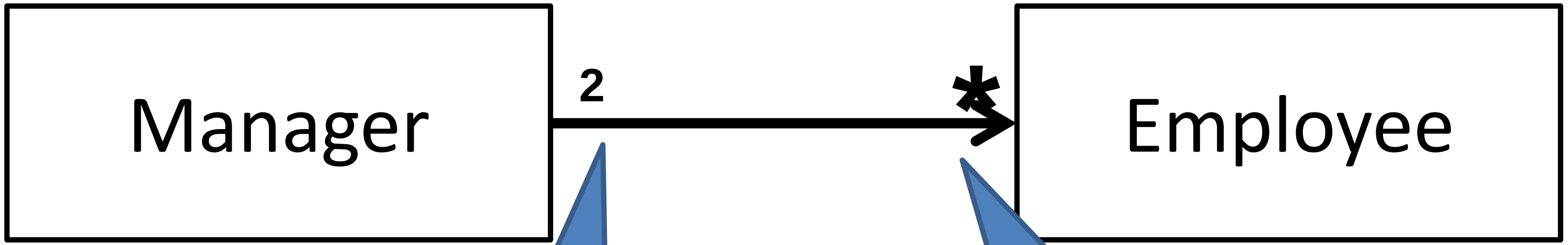
Review: GUI Layout

- Complete quiz questions 2, 3, and 4 now
- We will get to question 1 soon

Review UML Notation: Cardinality


Implictly 1
Manager
1..10
Employee
Each manager has between 1 and 10 employees. Maybe in an arraylist?

More Cardinality

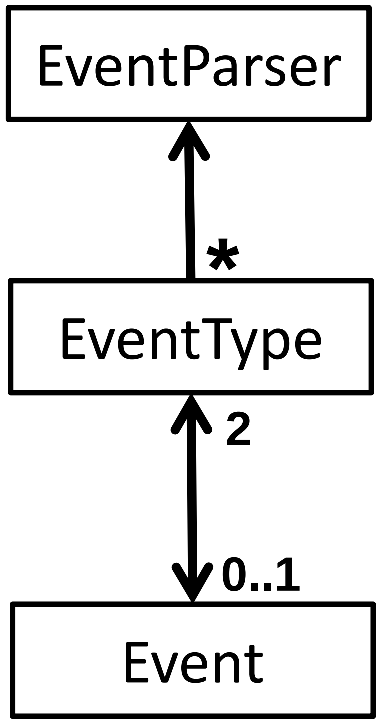


Every employee has exactly 2 managers. Note that this can be used even if there is no reference from Employee to Manager

Managers have any number of employees.

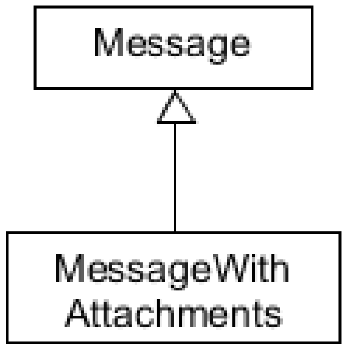
The * means “zero to infinity” – any arbitrary number. You can also occasionally see something like 4..* to mean 4 or more.

What does this diagram mean?

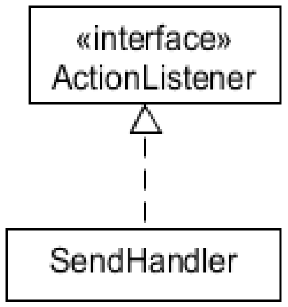


Summary of UML Class Diagram Arrows

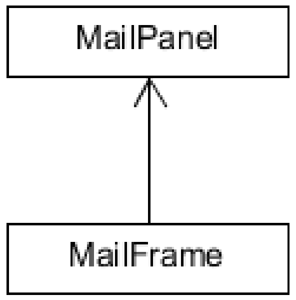
Inheritance (is-a)



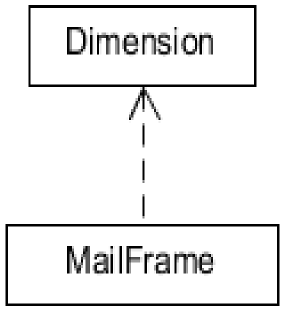
Interface Implementation (is-a)

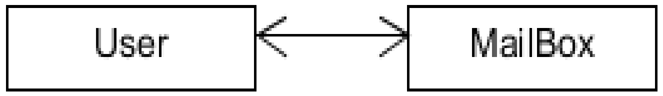


Association (has-a-field)

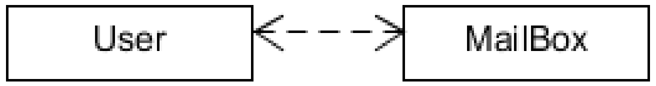


Dependency (depends-on)

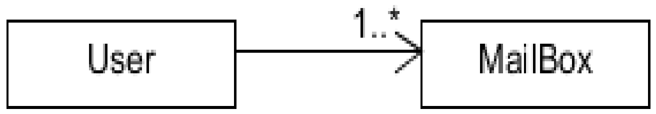




Two-way Association



Two-Way Dependency



Cardinality (one-to-one, one-to-many)
One-to-many is shown on left

Q1

Reading & writing files
When the unexpected happens

FILES AND EXCEPTIONS

File I/O: Key Pieces

- Input: `File` and `Scanner`
- Output: `PrintWriter` and `println`
- ☺ Be kind to your OS: `close()` all files
- Letting users choose: `JFileChooser` and `File`
- Expect the unexpected: `Exception` handling
- Refer to examples when you need to…

Live code a level loader

Exception – What, When, Why, How?

- What:
  - Used to signal that something in the code has gone wrong
- When:
  - An error has occurred that cannot be handled in the current code
- Why:
  - Breaks the execution flow and passes exception up the stack

Exception – How?

- Throwing an exception:

```
throw new EOFException("Missing column");
```

- Handling (catching) an exception:

```
try {
        //code that COULD throw an exception
}
catch (ExceptionType ex) {
        //code to handle exception
}
```

- When caught you can:
  - Recover from the error OR exit gracefully

Q5

What happens when no exception is thrown?

```
Scanner inScanner;
try {
        inScanner =
                new Scanner(new File("test.txt"));
        //code for reading lines
} catch (IOException ex) {
        JOptionPane.
                showMessageDialog("File not found.");
} finally {
        inScanner.close();
}
```

If this line is successful

Code continues on

The catch never executes

This runs after code in try completes

What happens when exception is thrown?

```
Scanner inScanner;
try {
        inScanner =
                new Scanner(new File(“test.txt”);
        //code for reading lines
} catch (IOException ex) {
        JOptionPane.
                showMessageDialog("File not found.");
} finally {
        inScanner.close();
}
```

If this line throws exception

Code after exception never executes

This is the next line executed

After catch is executed, this runs

When exception is not handled?

```
public String readData(String filename)
                        throws IOException {
       Scanner inScanner =
              new Scanner(new File(filename));
       //code for reading lines
       inScanner.close();
}
```

If this line throws exception

Code does not execute,
Method breaks immediately

main -> readAllFiles -> readData

If unhandled, exception bounces to method that called it, then up the chain.

A Checkered Past

- Java has two sorts of exceptions

1. **Checked exceptions**: compiler **checks** that calling code isn't ignoring the problem
   - Used for **expected** problems
2. **Unchecked exceptions**: compiler lets us ignore these if we want
   - Used for fatal or avoidable problems
   - Are subclasses of RunTimeException or Error

A Tale of Two Choices

Dealing with checked exceptions

1. Can **propagate** the exception
   - Just declare that our method will pass any exceptions along…
   - `public void readFile() throws FileNotFoundException { …`
   - Used when our code isn't able to rectify the problem
2. Can handle the exception
   - Used when our code can rectify the problem

Q6

Handling Exceptions

- Use try-catch statement:

```
try {
    // potentially "exceptional" code
} catch (ExceptionType var) {
    // handle exception
}
```

Can repeat this part for as many different exception types as you need.

Related, try-finally for clean up:

```
try {
    // code that requires "clean up"
} // then maybe some catches
finally {
    // runs even if exception occurred
}
```

Q7

Exception Activity

- Look at the code in **FileAverage**, focusing on the use of exceptions
- Solve the problems in **FileBestScore**

Exam 2

- Paper part (~44 pts) includes:
- Questions about UML (~4 points)
- ~2 Design Problems (~14 points)
- Question about exceptions (~5 points)
- Compile/runtime/printing question (~11 points)
- Tracing a recursive function (~10 points)
- **You can bring 1 sheet of notes + OO Principles for 220 + UML Cheat sheet**

Exam 2

- Computer part includes:
- Recursion
- Problem where you must use inheritance or interfaces to remove code duplication
- Problem where you have to layout a GUI and handle updates using listeners

Don’t forget!

Take Moodle survey today to voice your preferences for project partners.

Arcade Game Project Group Survey

Bring review questions for Wednesday (if we have time and everyone finishes)