I/O Exceptions & Working with Files

December 5, 2007

ComS 207: Programming I (in Java)
Iowa State University, FALL 2007
Instructor: Alexander Stoytchev

Final Exam

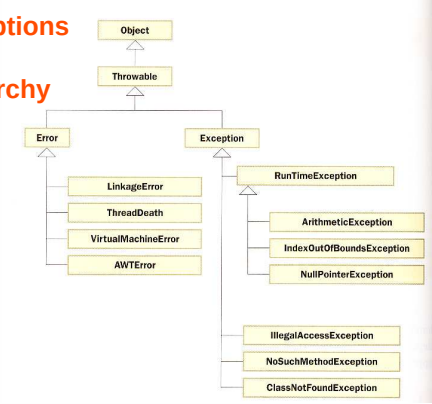
- **Time:**
  - **Thursday Dec 13 @ 4:30-6:30 p.m.**
- **Location:**
  - **Curtiss Hall, room 127 (classroom)**

Quick Review of Last Lecture

Exceptions

- **An *exception* is an object that describes an unusual or erroneous situation.**

Exceptions Class Hierarchy



On-line Java Documentation

- **http://java.sun.com/j2se/1.5.0/docs/api/index.html**

The try Statement

- To handle an exception in a program, the line that throws the exception is executed within a *try block*
- A try block is followed by one or more *catch* clauses
- Each catch clause has an associated exception type and is called an *exception handler*
- When an exception occurs, processing continues at the first catch clause that matches the exception type

The finally Clause

- A try statement can have an optional clause following the catch clauses, designated by the reserved word `finally`
- The statements in the finally clause always are executed
- If no exception is generated, the statements in the finally clause are executed after the statements in the try block complete
- If an exception is generated, the statements in the finally clause are executed after the statements in the appropriate catch clause complete

Example:

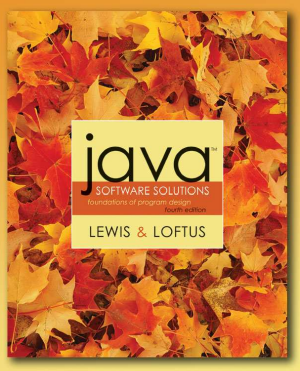
`MultipleCatch.java`

Example:

`NestedCatch.java`

Chapter 10

Sections 10.4 -10.6



PEARSON Addison Wesley

Exception Propagation

- An exception can be handled at a higher level if it is not appropriate to handle it where it occurs
- Exceptions *propagate* up through the method calling hierarchy until they are caught and handled or until they reach the level of the `main` method
- A try block that contains a call to a method in which an exception is thrown can be used to catch that exception

Exception Propagation

- See `Propagation.java` (page 539)
- See `ExceptionScope.java` (page 540)

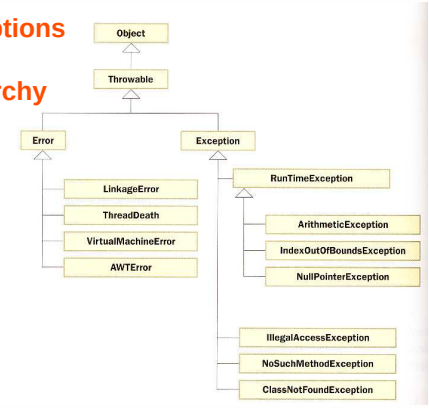
Checked Exceptions

- An exception is either *checked* or *unchecked*
- A *checked exception* either must be caught by a method, or must be listed in the *throws clause* of any method that may throw or propagate it
- A throws clause is appended to the method header
- The compiler will issue an error if a checked exception is not caught or asserted in a throws clause

Unchecked Exceptions

- An unchecked exception does not require explicit handling, though it could be processed that way
- The only unchecked exceptions in Java are objects of type `RuntimeException` or any of its descendants
- Errors are similar to `RuntimeException` and its descendants in that:
  - Errors should not be caught
  - Errors do not require a throws clause

Exceptions Class Hierarchy



The throw Statement

- Exceptions are thrown using the *throw* statement
- Usually a throw statement is executed inside an if statement that evaluates a condition to see if the exception should be thrown
- See `CreatingExceptions.java` (page 543)
- See `OutOfRangeException.java` (page 544)

I/O Exceptions

- Let's examine issues related to exceptions and I/O
- A *stream* is a sequence of bytes that flow from a source to a destination
- In a program, we read information from an input stream and write information to an output stream
- A program can manage multiple streams simultaneously

Standard I/O

- There are three standard I/O streams:
  - *standard output* – defined by `System.out`
  - *standard input* – defined by `System.in`
  - *standard error* – defined by `System.err`

Standard I/O

- We use `System.out` when we execute `println` statements
- `System.out` and `System.err` typically represent a particular window on the monitor screen
- `System.in` typically represents keyboard input, which we've used many times with `Scanner` objects

The IOException Class

- Operations performed by some I/O classes may throw an `IOException`
  - A file might not exist
  - Even if the file exists, a program may not be able to find it
  - The file might not contain the kind of data we expect
- An `IOException` is a checked exception

Examples:

`FileNotFound.java`

`FileNotFound_Caught.java`

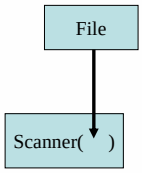

```
public Scanner(File source) throws FileNotFoundException
{

}
```


Reading from Text Files

- **Example: FileScanner.java**
- **Syntax:**
- **Scanner scan = new Scanner (new File("myfile.txt"));**

FileScanner.java



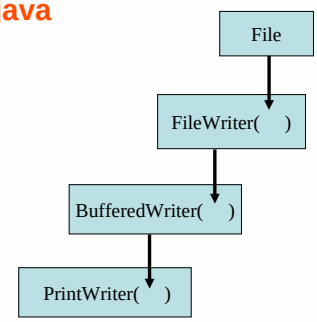
Writing Text Files

- In Chapter 5 we explored the use of the `Scanner` class to read input from a text file
- Let's now examine other classes that let us write data to a text file
- The `FileWriter` class represents a text output file, but with minimal support for manipulating data
- Therefore, we also rely on `PrintStream` objects, which have `print` and `println` methods defined for them

Writing Text Files

- Finally, we'll also use the `PrintWriter` class for advanced internationalization and error checking
- We build the class that represents the output file by combining these classes appropriately
- See `TestData.java` (page 547)
- Output streams should be closed explicitly

TestData.java



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