Introduction to Java

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Content

- Exception handling
- File handling

Java -Exceptions

Java exception handling

An exception (or exceptional event) is a problem that arises during the execution of a program. When an **Exception** occurs the normal flow of the program is disrupted and the program/Application terminates abnormally, which is not recommended, therefore, these exceptions are to be handled.

Following are some scenarios where an exception occurs

- A user has entered an invalid data.
- A file that needs to be opened cannot be found.
- A network connection has been lost in the middle of communications or the JVM has run out of memory.

How exception handling works in java

Checked exceptions − A checked exception is an exception that is checked (notified) by the compiler at compilation-time, these are also called as compile time exceptions. These exceptions cannot simply be ignored, the programmer should take care of (handle) these exceptions.

```
import java.io.File;
import java.io.FileReader;

public class FilenotFound_Demo {

   public static void main(String args[]) {
      File file = new File("E://file.txt");
      FileReader fr = new FileReader(file);
   }
}
```

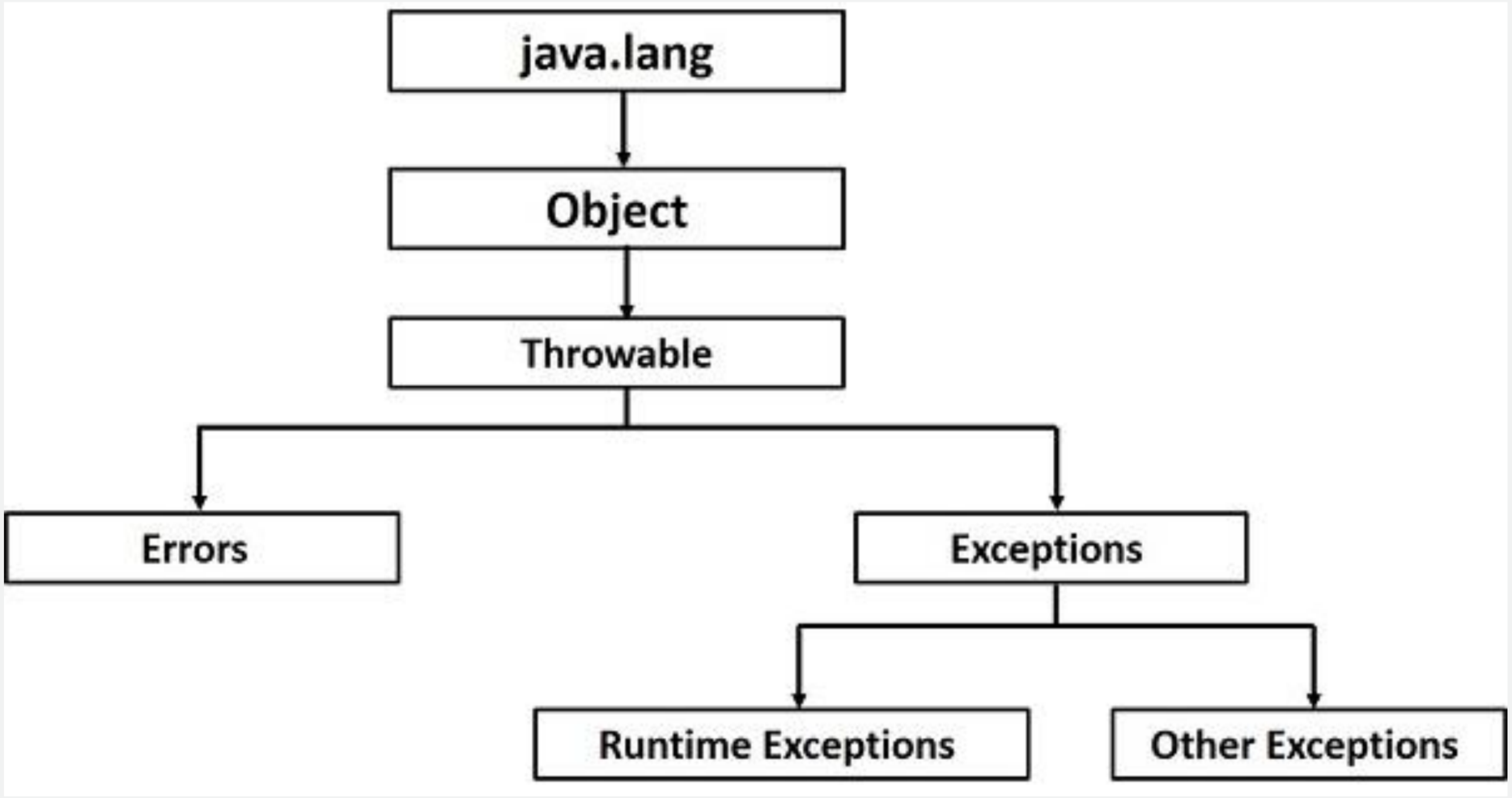
How exception handling works in java

Unchecked exceptions − An unchecked exception is an exception that occurs at the time of execution. These are also called as **Runtime Exceptions**. These include programming bugs, such as logic errors or improper use of an API. Runtime exceptions are ignored at the time of compilation.

```
public class Unchecked_Demo {

   public static void main(String args[]) {
      int num[] = {1, 2, 3, 4};
      System.out.println(num[5]);
   }
}
```

Exception Hierarchy



Exceptions Methods

Following is the list of important methods available in the Throwable class.

Sr.No.	Method & Description
1	**public String getMessage()** Returns a detailed message about the exception that has occurred. This message is initialized in the Throwable constructor.
2	**public Throwable getCause()** Returns the cause of the exception as represented by a Throwable object.
3	**public String toString()** Returns the name of the class concatenated with the result of getMessage().
4	**public void printStackTrace()** Prints the result of toString() along with the stack trace to System.err, the error output stream.
5	**public StackTraceElement [] getStackTrace()** Returns an array containing each element on the stack trace. The element at index 0 represents the top of the call stack, and the last element in the array represents the method at the bottom of the call stack.
6	**public Throwable fillInStackTrace()** Fills the stack trace of this Throwable object with the current stack trace, adding to any previous information in the stack trace.

Catching Exceptions

- A method catches an exception using a combination of the **try** and **catch** keywords. A try/catch block is placed around the code that might generate an exception. Code within a try/catch block is referred to as protected code

```
try {
// Protected code
} catch (ExceptionName e1) {
// Catch block
}
```

```
// File Name : ExcepTest.java
import java.io.*;

public class ExcepTest {

   public static void main(String args[]) {
      try {
         int a[] = new int[2];
         System.out.println("Access element three :" + a[3]);
      } catch (ArrayIndexOutOfBoundsException e) {
         System.out.println("Exception thrown  :" + e);
      }
      System.out.println("Out of the block");
   }
}
```

Multiple Catch Blocks

- A try block can be followed by multiple catch blocks.

```
try {
// Protected code
} catch (ExceptionType1 e1) {
// Catch block
} catch (ExceptionType2 e2) {
// Catch block
} catch (ExceptionType3 e3) {
// Catch block
}
```

```
try {
   file = new FileInputStream(fileName);
   x = (byte) file.read();
} catch (IOException i) {
   i.printStackTrace();
   return -1;
} catch (FileNotFoundException f) // Not valid! {
   f.printStackTrace();
   return -1;
}
```

Or

```
catch (IOException|FileNotFoundException ex) {
logger.log(ex);
throw ex;
```

The Throws / Throw Keyword

- If a method does not handle a checked exception, the method must declare it using the **throws** keyword. The throws keyword appears at the end of a method's signature.
- You can throw an exception, either a newly instantiated one or an exception that you just caught, by using the **throw** keyword.
- *throws* is used to postpone the handling of a checked exception and *throw* is used to invoke an exception explicitly.

```
public class Main {
  static void checkAge(int age) {
    if (age < 18) {
      throw new ArithmeticException("Access denied - You must be at least 18 years old.");}
    else {
      System.out.println("Access granted - You are old enough!");}}
public static void main(String[] args) {
    checkAge(15); // Set age to 15 (which is below 18...)
  }}
```

```
import java.io.*;
public class className {

   public void deposit(double amount) throws
RemoteException {
      // Method implementation
      throw new RemoteException();
   }
   // Remainder of class definition
}
```

The Finally Block

The finally block follows a try block or a catch block. A finally block of code always executes, irrespective of occurrence of an Exception.
Using a finally block allows you to run any cleanup-type statements that you want to execute, no matter what happens in the protected code.

```
try {
// Protected code
} catch (ExceptionType1 e1) {
// Catch block
} catch (ExceptionType2 e2) {
// Catch block
} catch (ExceptionType3 e3) {
// Catch block
}finally {
// The finally block always executes.
}
```

The Finally Block

```
public class ExcepTest {

   public static void main(String args[]) {
      int a[] = new int[2];
      try {
         System.out.println("Access element three :" +
a[3]);
      } catch (ArrayIndexOutOfBoundsException e) {
         System.out.println("Exception thrown  :" + e);
      }finally {
         a[0] = 6;
         System.out.println("First element value: " + a[0]);
         System.out.println("The finally statement is
executed");
      }
   }
}
```

User-Defined Exceptions

You can create your own exceptions in Java. Keep the following points in mind when writing your own exception classes −

All exceptions must be a child of Throwable.

If you want to write a checked exception that is automatically enforced by the Handle or Declare Rule, you need to extend the Exception class.

If you want to write a runtime exception, you need to extend the RuntimeException class.

```
class MyException extends Exception {
}
```

File handlina

01. Java File Handling

Java File Handlina

The File class from the java.io package, allows us to work with files.

To use the File class, create an object of the class, and specify the filename or directory name:

```
import java.io.File;  // Import the File class
File myObj = new File("filename.txt"); // Specify the filename
```

Java File Handling

The `File` class has many useful methods for creating and getting information about files. For example:

Method	Type	Description
`canRead()`	Boolean	Tests whether the file is readable or not
`canWrite()`	Boolean	Tests whether the file is writable or not
`createNewFile()`	Boolean	Creates an empty file
`delete()`	Boolean	Deletes a file
`exists()`	Boolean	Tests whether the file exists
`getName()`	String	Returns the name of the file
`getAbsolutePath()`	String	Returns the absolute pathname of the file
`length()`	Long	Returns the size of the file in bytes
`list()`	String[]	Returns an array of the files in the directory
`mkdir()`	Boolean	Creates a directory

02. Create Files

To create a file in Java, you can use the createNewFile() method. This method returns a boolean value: true if the file was successfully created, and false if the file already exists. Note that the method is enclosed in a try...catch block. This is necessary because it throws an IOException if an error occurs (if the file cannot be created for some reason):

```
import java.io.File;  // Import the File class
import java.io.IOException;  // Import the IOException class to handle errors

public class CreateFile {
  public static void main(String[] args) {
    try {
      File myObj = new File("filename.txt");
      if (myObj.createNewFile()) {
        System.out.println("File created: " + myObj.getName());
      } else {
        System.out.println("File already exists.");
      }} catch (IOException e) {
      System.out.println("An error occurred.");
      e.printStackTrace();}}}
```

03. Files

In the following example, we use the FileWriter class together with its write() method to write some text to the file we created in the example above. Note that when you are done writing to the file, you should close it with the close() method:

```
import java.io.FileWriter;   // Import the FileWriter class
import java.io.IOException;  // Import the IOException class to handle errors

public class WriteToFile {
  public static void main(String[] args) {
    try {
      FileWriter myWriter = new FileWriter("filename.txt");
      myWriter.write("Files in Java might be tricky, but it is fun enough!");
      myWriter.close();
      System.out.println("Successfully wrote to the file.");
    } catch (IOException e) {
      System.out.println("An error occurred.");
      e.printStackTrace();}}}
```

04. Java Read files

Read a file

we use the Scanner class to read the contents of the text file we created in the previous chapter:

```
import java.io.File; // Import the File class import
java.io.FileNotFoundException; // Import this class to handle errors import
java.util.Scanner; // Import the Scanner class to read text files public
class ReadFile {
public static void main(String[] args) {
try { File myObj = new File("filename.txt");
Scanner myReader = new Scanner(myObj);
while (myReader.hasNextLine()) { String data = myReader.nextLine();
System.out.println(data); } myReader.close(); }
catch (FileNotFoundException e) { System.out.println("An error occurred.");
e.printStackTrace(); } } }
```

Get file information

```
import java.io.File;  // Import the File class

public class GetFileInfo {
  public static void main(String[] args) {
    File myObj = new File("filename.txt");
    if (myObj.exists()) {
      System.out.println("File name: " + myObj.getName());
      System.out.println("Absolute path: " + myObj.getAbsolutePath());
      System.out.println("Writeable: " + myObj.canWrite());
      System.out.println("Readable " + myObj.canRead());
      System.out.println("File size in bytes " + myObj.length());
    } else {
      System.out.println("The file does not exist.");
    }
  }
}
```

05. Java Delete files

Java Delete file

Use delete() method

```
import java.io.File;  // Import the File class

public class DeleteFile {
  public static void main(String[] args) {
    File myObj = new File("filename.txt");
    if (myObj.delete()) {
      System.out.println("Deleted the file: " + myObj.getName());
    } else {
      System.out.println("Failed to delete the file.");
    }
  }
}
```

Java Delete folder

It must be empty

```
import java.io.File;

public class DeleteFolder {
  public static void main(String[] args) {
    File myObj = new File("C:\\Users\\MyName\\Test");
    if (myObj.delete()) {
      System.out.println("Deleted the folder: " + myObj.getName());
    } else {
      System.out.println("Failed to delete the folder.");
    }
  }
}
```