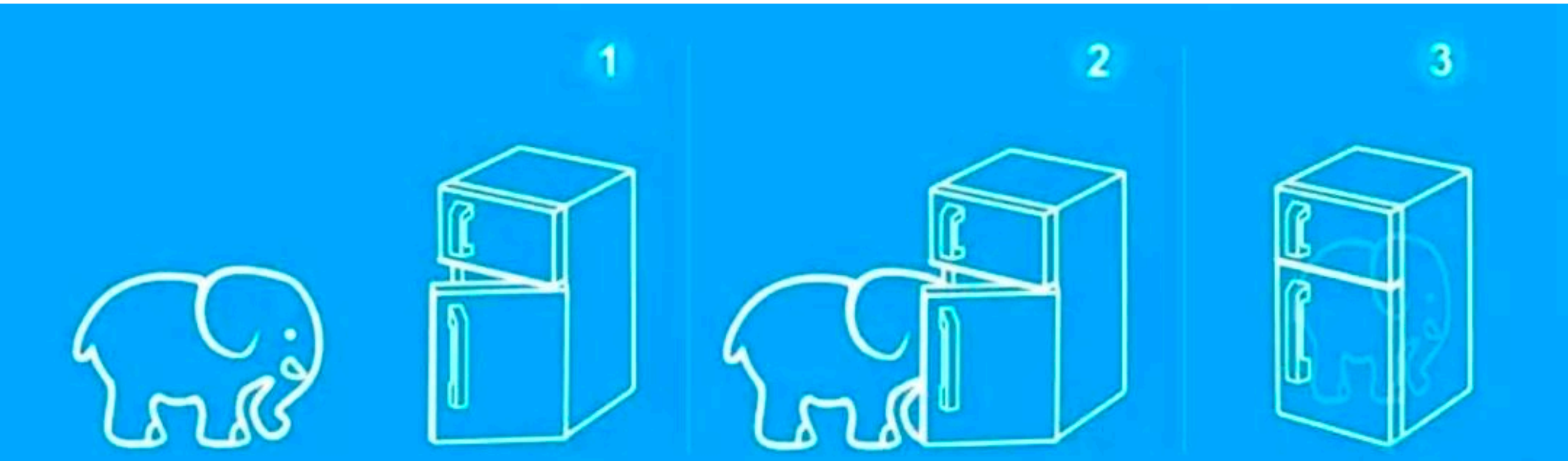
异常处理

杨亮

把大象放进冰箱需要几步



门打不开怎么办

大象不进去怎么办

门关不上怎么办

墨菲定律

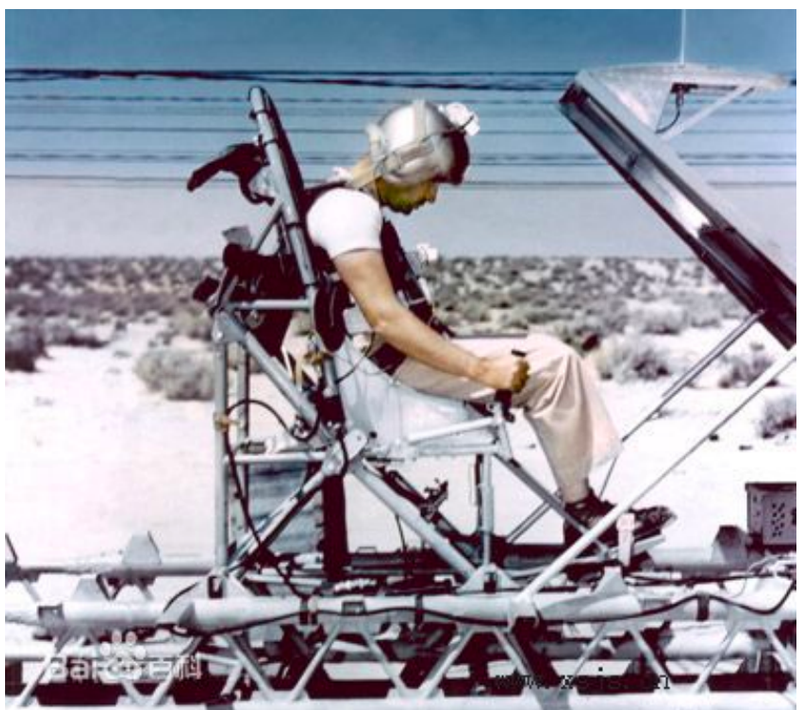
凡是可能出错的事有很大几率会出错

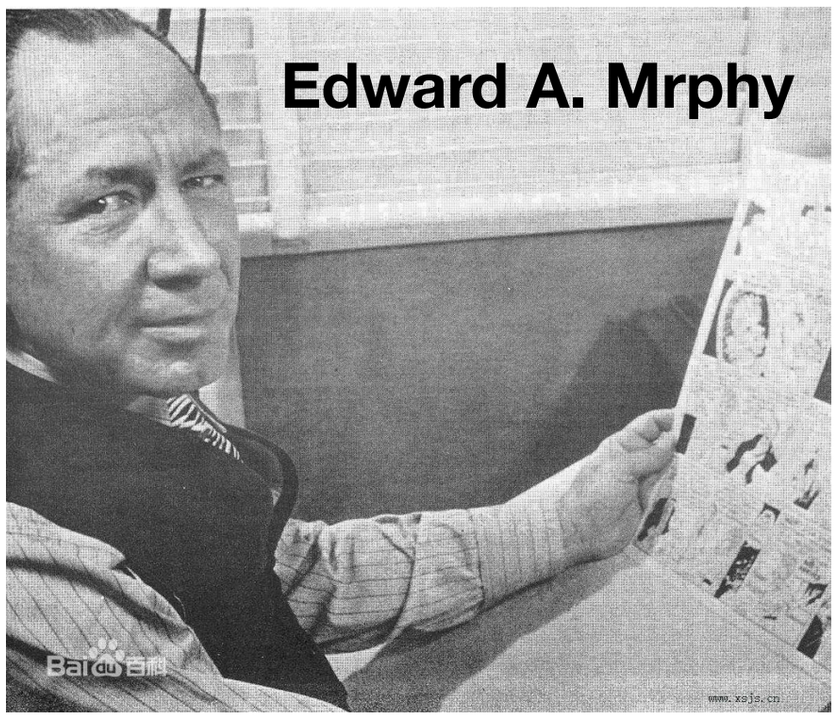
一、任何事都没有表面看起来那么简单；

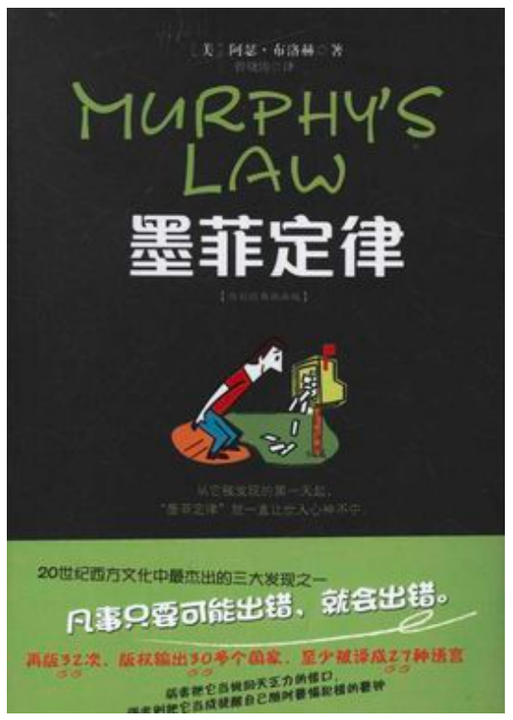
二、所有的事都会比你预计的时间长；

三、会出错的事总会出错；

四、如果你担心某种情况发生，那么它就更有可能发生。

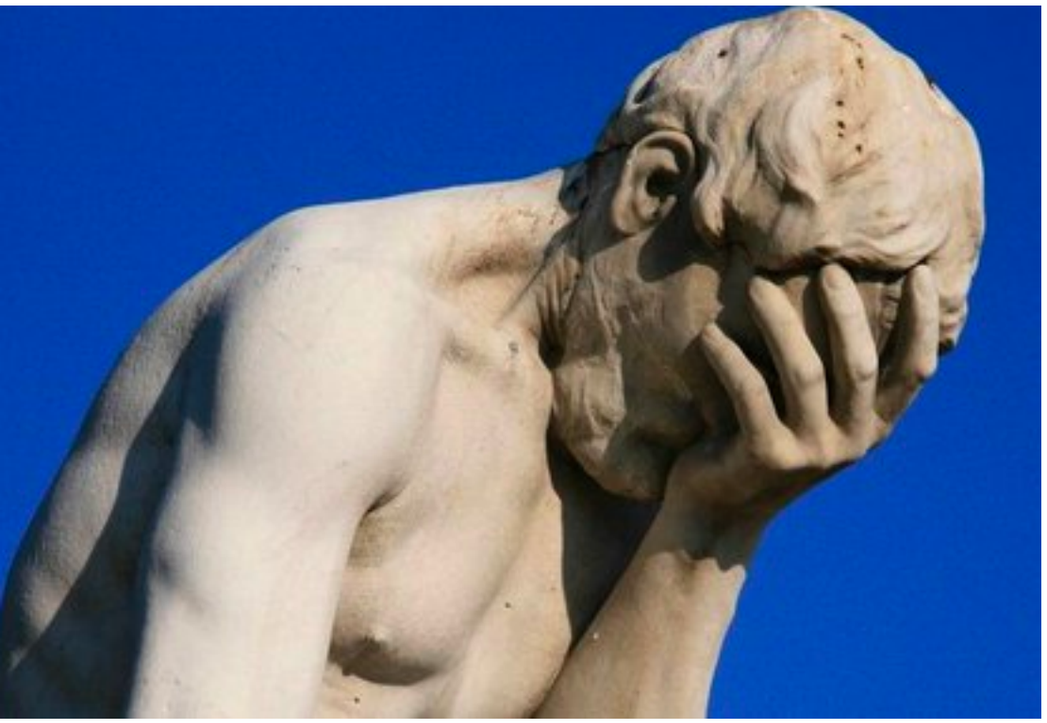






一个简单的程序例子

```
readFile {
      open the file;
      determine its size;
      allocate that much memory;
      read the file into memory;
      close the file;
}
```



- 如果无法打开文件会发生什么?
- 如果无法确定文件的长度，会发生什么?
- 如果不能分配足够的内存，会发生什么?
- 如果读取失败会发生什么?
- 如果文件无法关闭会怎么样?

面向过程的代码

```
errorCodeType readFile {
    initialize errorCode = 0;

    open the file;
    if (theFileIsOpen) {
        determine the length of the file;
        if (gotTheFileLength) {
            allocate that much memory;
            if (gotEnoughMemory) {
                read the file into memory;
                if (readFailed) {
                    errorCode = -1;
                }
            } else {
                errorCode = -2;
            }
        } else {
            errorCode = -3;
        }
        close the file;
        if (theFileDidntClose && errorCode == 0) {
            errorCode = -4;
        } else {
            errorCode = errorCode and -4;
        }
    } else {
        errorCode = -5;
    }
    return errorCode;
}
```

```
readFile {
    open the file;
    determine its size;
    allocate that much memory;
    read the file into memory;
    close the file;
}
```

- 如果无法打开文件会发生什么?
- 如果无法确定文件的长度，会发生什么?
- 如果不能分配足够的内存，会发生什么?
- 如果读取失败会发生什么?
- 如果文件无法关闭会怎么样?

将错误处理代码与“常规”代码分离

```
readFile {
    try {
        open the file;
        determine its size;
        allocate that much memory;
        read the file into memory;
        close the file;
    } catch (fileOpenFailed) {
        doSomething;
    } catch (sizeDeterminationFailed) {
        doSomething;
    } catch (memoryAllocationFailed) {
        doSomething;
    } catch (readFailed) {
        doSomething;
    } catch (fileCloseFailed) {
        doSomething;
    }
}
```

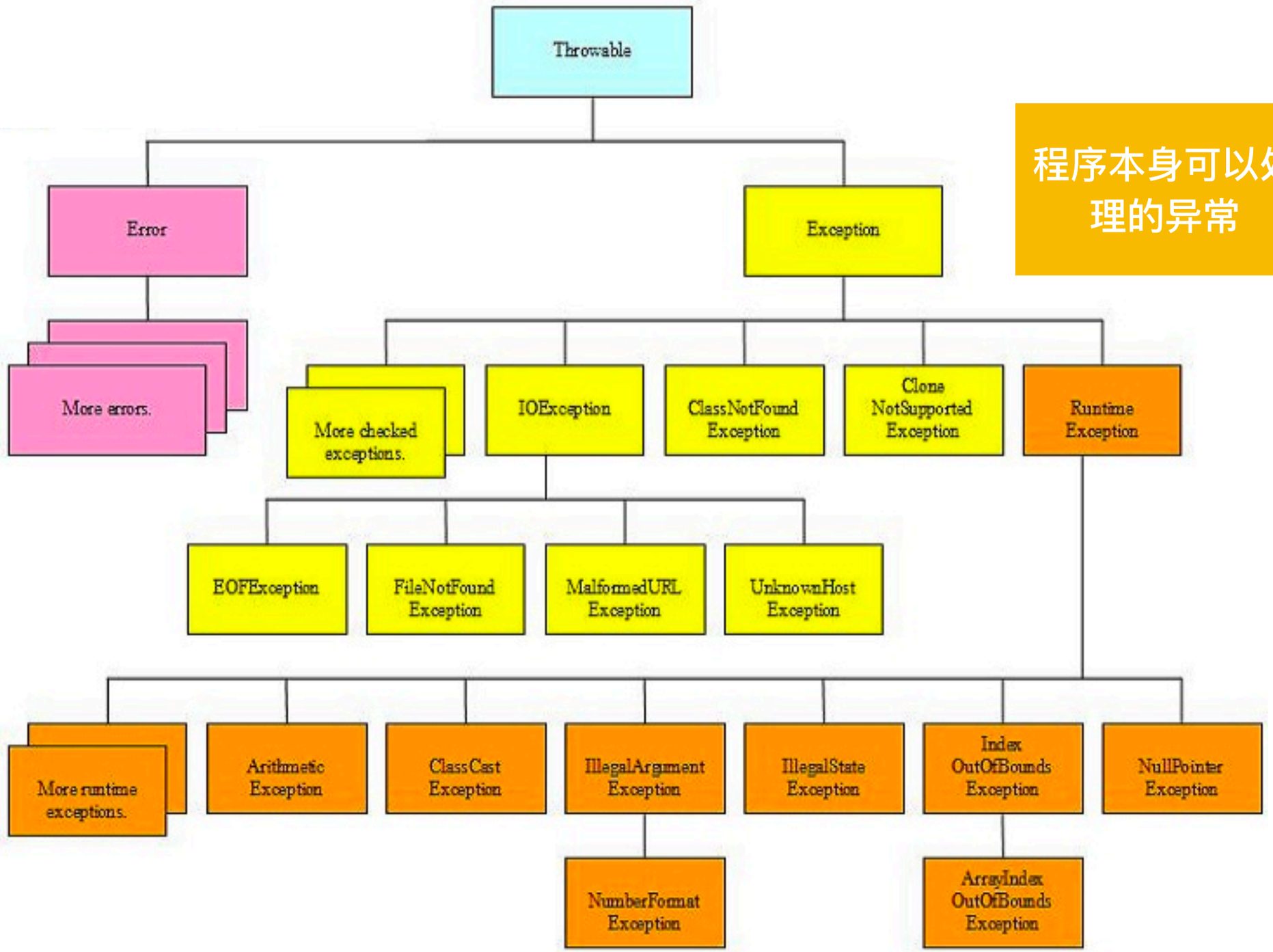
“常规”代码

错误处理代码

异常处理的优势

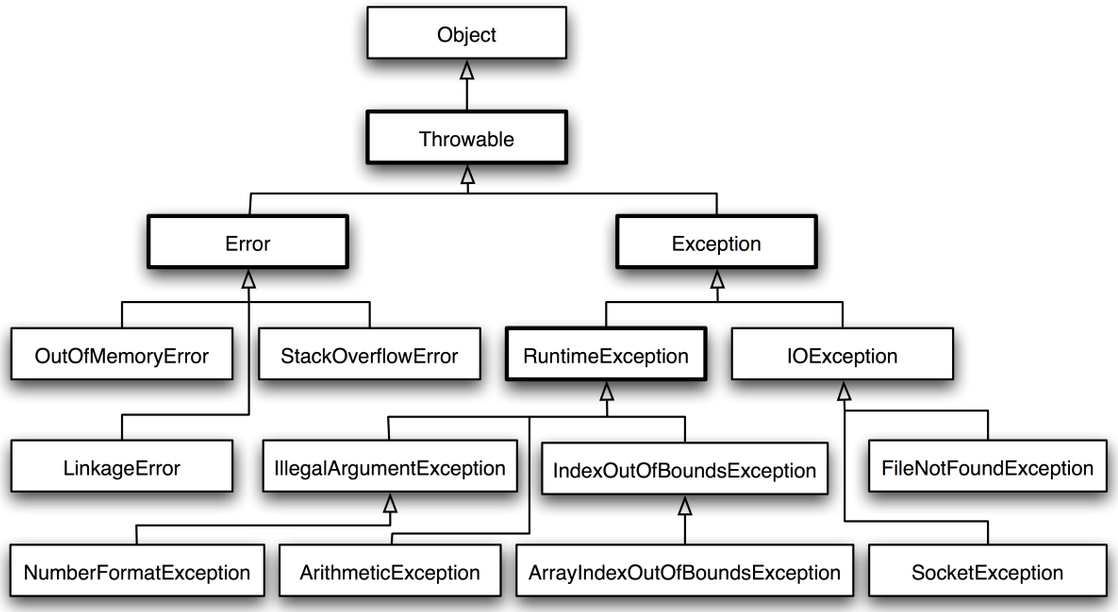
异常也是对象

JVM的异常
与程序无关

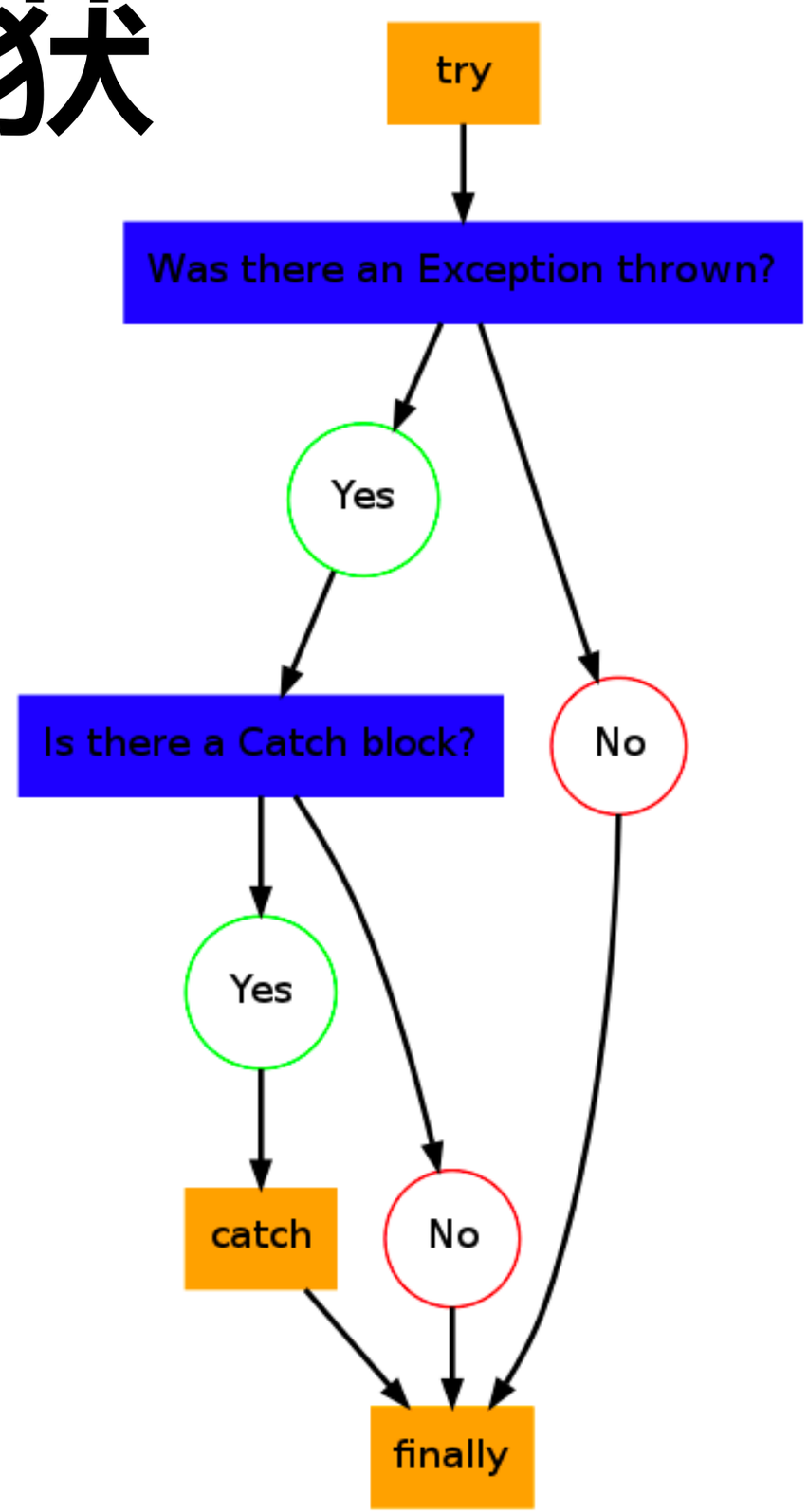


程序本身可以处
理的异常

异常的捕获




```
try {
        // 可能会发生异常的程序代码
} catch (Type1 id1) {
        // 捕获并处理try抛出的异常类型Type1
} catch (Type2 id2) {
        // 捕获并处理try抛出的异常类型Type2
} finally {
        // 无论是否发生异常，都将执行的语句块
}
```



系统定义的异常会自动抛出，程序只需要负责捕获和处理

看个例子

```
1  public class TestException {
2          public static void main(String args[]) {
3                  int i = 0;
4                  String greetings[] = { " Hello world !", " Hello World !! ",
5                                         " HELLO WORLD !!!" };
6                  while (i < 4) {
7                          try {
8                                  // 特别注意循环控制变量i的设计，避免造成无限循环
9                                  System.out.println(greetings[i++]);
10                         } catch (ArrayIndexOutOfBoundsException e) {
11                                 System.out.println("数组下标越界异常");
12                         } finally {
13                                 System.out.println("----------------------------");
14                         }
15                 }
16         }
17 }
```

异常的抛出与声明

对于会抛出但不处理异常的函数
应该声明抛出异常的类型

```
[修饰符] 返回值类型 方法名([参数列表]) [throws 异常名] {
    语句序列;
    throw new 异常名(message);
    语句序列;
}
```

程序也可以在函数中手动地抛出异常
（Throwable子类）

手动抛出异常例子

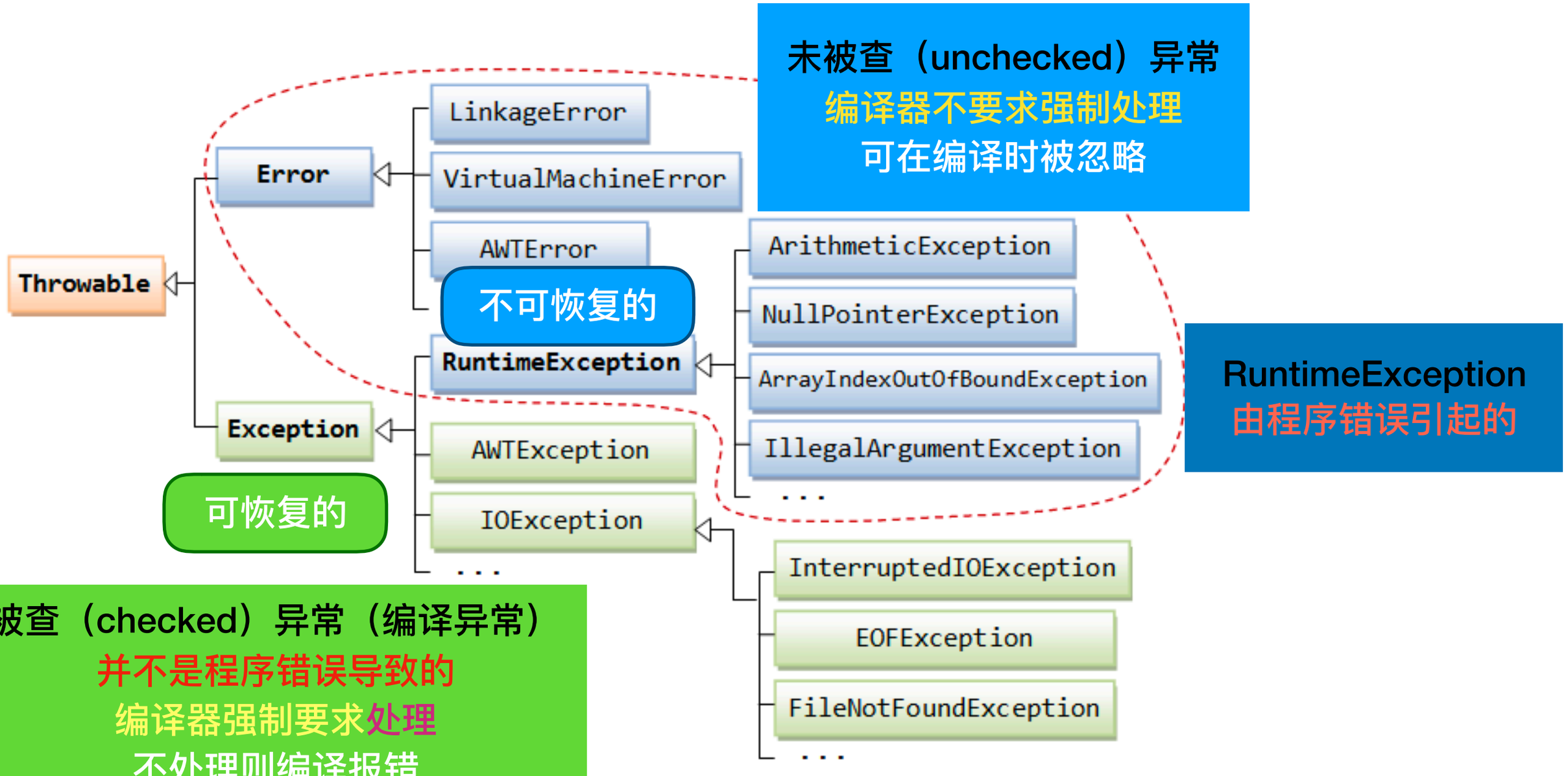
```java
public class TestException {
        static int quotient(int x, int y) throws MyException { // 定义方法抛出异常
                if (y < 0) { // 判断参数是否小于0
                        throw new MyException("除数不能是负数"); // 异常信息
                }
                return x/y; // 返回值
        }
        public static void main(String args[]) { //
                int  a =3;
                int  b =0;
                try { // try语句包含可能发生异常的语句
                        int result = quotient(a, b); // 调用方法quotient()
                } catch (MyException e) { // 处理自定义异常
                        System.out.println(e.getMessage()); // 输出异常信息
                } catch (ArithmeticException e) { // 处理ArithmeticException异常
                        System.out.println("除数不能为0"); // 输出提示信息
                } catch (Exception e) { // 处理其他异常
                        System.out.println("程序发生了其他的异常"); // 输出提示信息
                }
        }

}
```

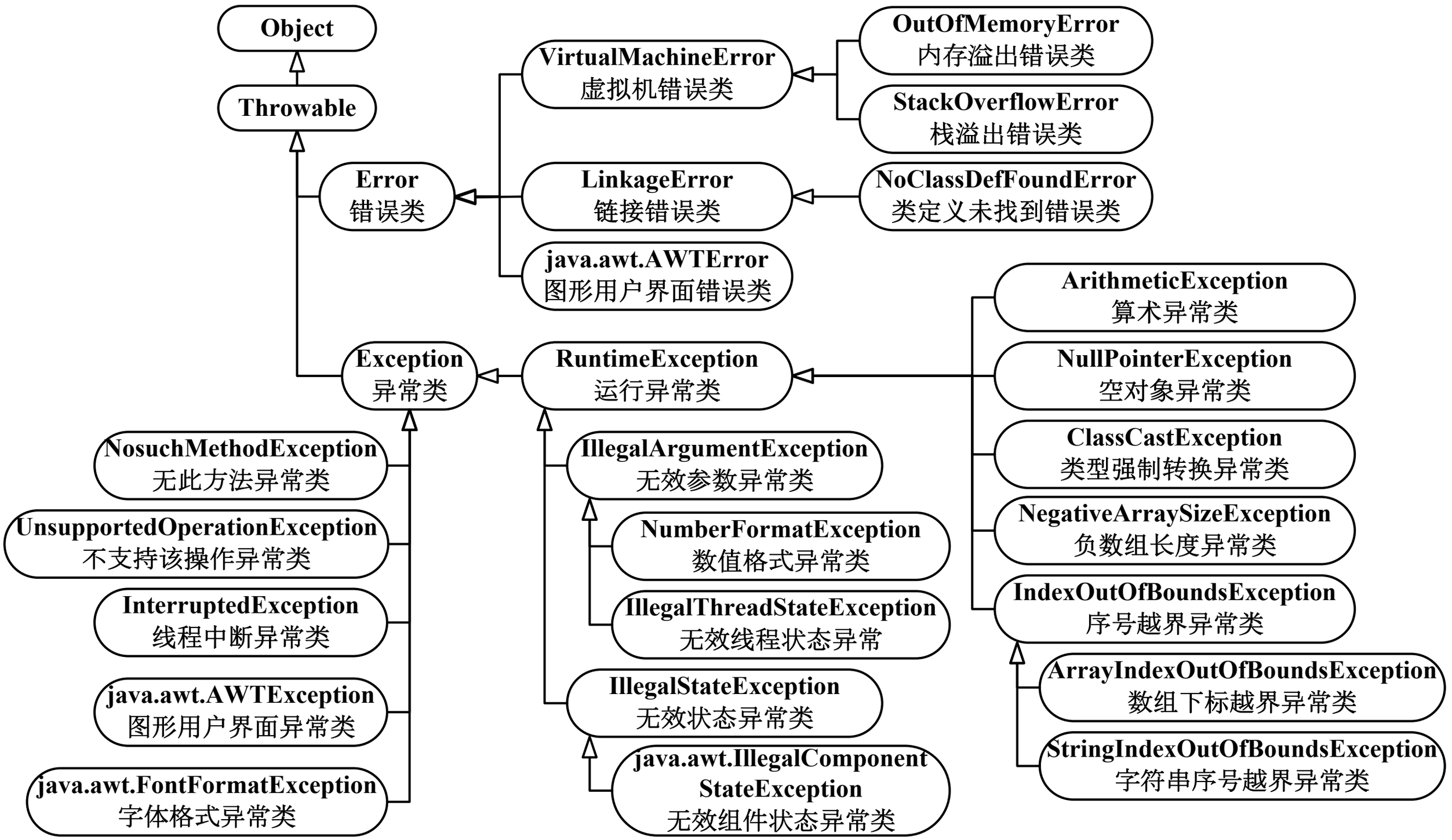
```java
class MyException extends Exception { // 创建自定义异常类
        String message; // 定义String类型变量
        public MyException(String ErrorMessagr) { // 父类方法
                message = ErrorMessagr;
        }

        public String getMessage() { // 覆盖getMessage()方法
                return message;
        }
}
```

异常的分类


Throwable
Error
LinkageError
VirtualMachineError
AWTError
Exception
RuntimeException
AWTException
IOException
...
ArithmeticException
NullPointerException
ArrayIndexOutOfBoundException
IllegalArgumentException
...
InterruptedIOException
EOFException
FileNotFoundException
...
未被查（unchecked）异常
编译器不要求强制处理
可在编译时被忽略
不可恢复的
可恢复的
RuntimeException
由程序错误引起的
被查（checked）异常（编译异常）
并不是程序错误导致的
编译器强制要求处理
不处理则编译报错
所谓处理是指，要不在函数中捕获，要不声明函数将抛出
Handle Or Declare Rule

常见的异常


Object
Throwable
Error
错误类
VirtualMachineError
虚拟机错误类
OutOfMemoryError
内存溢出错误类
StackOverflowError
栈溢出错误类
LinkageError
链接错误类
NoClassDefFoundError
类定义未找到错误类
java.awt.AWTError
图形用户界面错误类
Exception
异常类
RuntimeException
运行异常类
ArithmeticException
算术异常类
NullPointerException
空对象异常类
ClassCastException
类型强制转换异常类
NegativeArraySizeException
负数组长度异常类
IndexOutOfBoundsException
序号越界异常类
ArrayIndexOutOfBoundsException
数组下标越界异常类
StringIndexOutOfBoundsException
字符串序号越界异常类
NosuchMethodException
无此方法异常类
UnsupportedOperationException
不支持该操作异常类
InterruptedException
线程中断异常类
java.awt.AWTException
图形用户界面异常类
java.awt.FontFormatException
字体格式异常类
IllegalArgumentException
无效参数异常类
NumberFormatException
数值格式异常类
IllegalThreadStateException
无效线程状态异常
IllegalStateException
无效状态异常类
java.awt.IllegalComponent
StateException
无效组件状态异常类

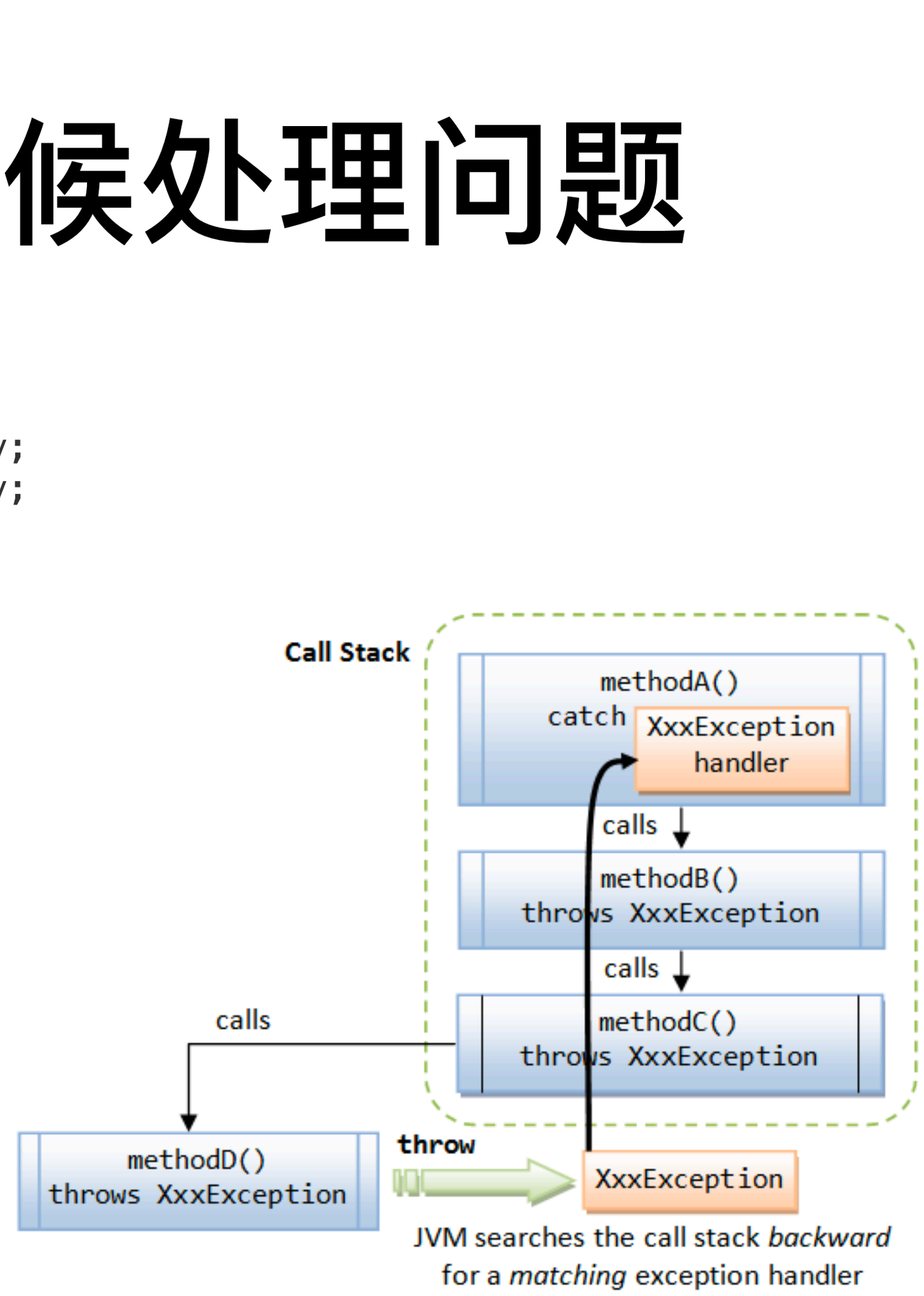
该什么时候处理问题

```
methodD {
        open the file;
        determine its size;
        allocate that much memory;
        read the file into memory;
        close the file;
}
```

```
methodA {
    try {
        call methodB;
    } catch (exception e) {
        doErrorProcessing;
    }
}

methodB throws exception {
    call methodC;
}

methodC throws exception {
    call methodD;
}
```



异常的优势

将错误处理代码与“常规”代码分离

将错误沿调用推栈向上传递