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CHANGE THE WORLD FROM HERE

Exception Handling

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https://www.cs.usfca.edu/

Java Exception Handling

- Program can operate even if exceptions occur
  - Warn and continue, or terminate gracefully
- Allows for grouping of types of exceptions
- Separates exception handling logic from normal functionality

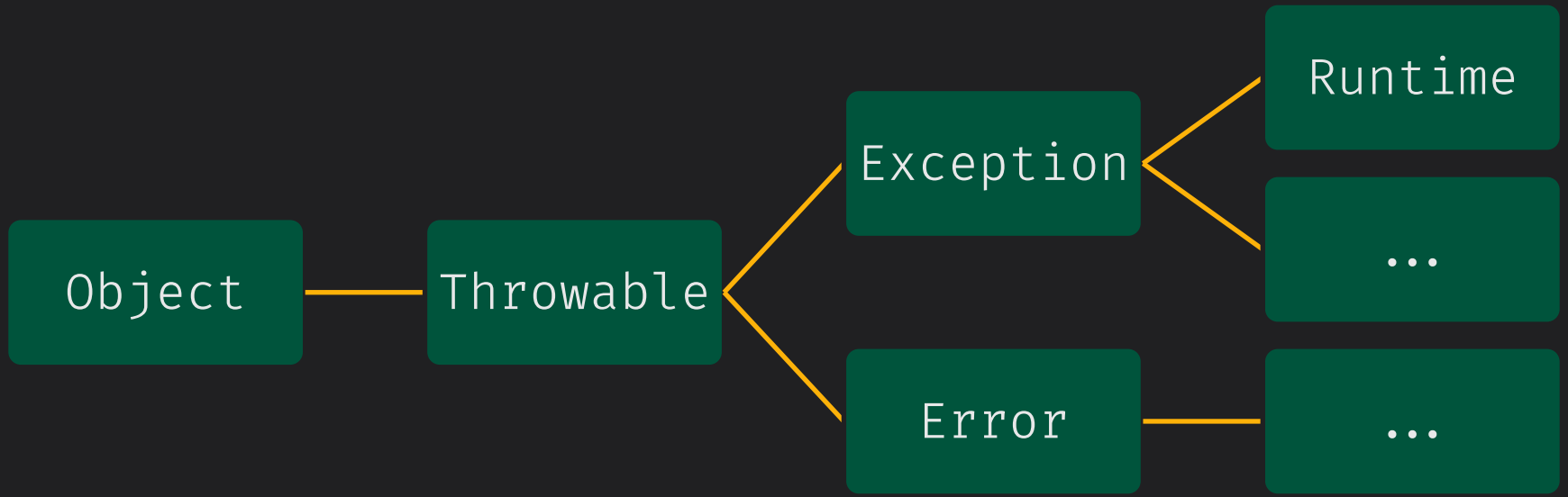
https://docs.oracle.com/javase/tutorial/essential/exceptions/advantages.html

Types of Exceptions

Type	Description	Catch/Throw?
Error	Problem occurred **external** to application (in the JVM)	*Not Usually*
Runtime Exception	Programs **cannot** anticipate or recover from, usually a bug	Optional
Checked Exception	Programs **should** anticipate and recover from	**Required**

https://docs.oracle.com/javase/tutorial/essential/exceptions/catchOrDeclare.html

Exception Hierarchy



https://docs.oracle.com/javase/tutorial/essential/exceptions/throwing.html

Errors

- Indicate a serious problem external to program (in the JVM) occurred
- Usually not addressed by simple programs
- For example, an **`IOError`** from hard drive failure while reading an open file

https://docs.oracle.com/javase/tutorial/essential/exceptions/throwing.html

Runtime Exceptions

- Includes all **`Exception`** subclasses under **`RuntimeException`**
- Can be caught or thrown, but not required
- Often indicates code defects
- For example, accessing an array out of bounds

https://docs.oracle.com/javase/tutorial/essential/exceptions/catchOrDeclare.html

Common Runtime Exceptions

- ArithmeticException
- IndexOutOfBoundException
  - ArrayIndexOutOfBoundsException
  - StringIndexOutOfBoundsException
- NegativeArraySizeException
- NullPointerException

https://docs.oracle.com/en/java/javase/15/docs/api/java.base/java/lang/RuntimeException.html

Checked Exceptions

- Includes all **`Exception`** subclasses **except** those under **`RuntimeException`**
- Should be anticipated by programmer
- Must be handled by application
- For example, trying to open an non-existent file

https://docs.oracle.com/javase/tutorial/essential/exceptions/catchOrDeclare.html

Common IO Exceptions

- EOFException
- FileNotFoundException
- FileSystemException
- NoSuchFileException
- CharacterCodingException
- MalformedInputException

https://docs.oracle.com/en/java/javase/15/docs/api/java.base/java/io/IOException.html

Handling Checked Exceptions

- Use **`try`**, **`catch`**, **`finally`** blocks to handle
- Use try-with-resources blocks
  - Added in Java 7 to auto-close resources
- Use **`throws`** keyword and catch elsewhere
  - Catch where makes sense to handle exception

Catching Exceptions

- Any exception type (even unchecked) can be caught
- Can specify multiple catch blocks for each try
  - Will execute first matching catch block
- Related to inheritance, discussed more later
- Can catch more than one exception per handler
- Can throw exceptions within handlers

API Example

nextInt

`public int nextInt()`

Scans the next token of the input as an `int`.

An invocation of this method of the form `nextInt()` behaves in exactly the same way as the invocation `nextInt(radix)`, where `radix` is the default radix of this scanner.

Returns:

the `int` scanned from the input

Throws:

`InputMismatchException` - if the next token does not match the *Integer* regular expression, or is out of range

`NoSuchElementException` - if input is exhausted

`IllegalStateException` - if this scanner is closed

https://www.cs.usfca.edu/~cs272/javadoc/api/java.base/java/util/Scanner.html#nextInt()

Questions?