External vs. Internal Iteration in Java 8

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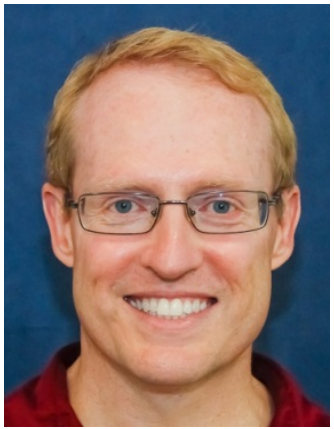

Learning Objectives in this Lesson

- Recognize the difference between external & internal iteration in Java 8

External Iteration Versus Internal Iteration

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```
List<String> namesList =
  Arrays.asList("Larry",
                "Curly",
                "Moe");

for (String name : namesList)
  System.out.println(name);
```

See docs.oracle.com/javase/1.5.0/docs/guide/language/foreach.html

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for (Iterator<String>> i =
       namesList.iterator();
     i.hasNext();)
  System.out.printLn(i.next());
```

See docs.oracle.com/javase/8/docs/api/java/util/Iterator.html

External Iteration Versus Internal Iteration

- Java 8 aggregate operations are responsible for internally iterating through Java streams

See docs.oracle.com/javase/tutorial/collections/streams/#differences

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List<String> namesList =
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namesList.stream().forEach
  (System.out::println);
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See docs.oracle.com/javase/8/docs/api/java/lang/Iterable.html#forEach

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List<URL> urls = Stream
    .of(urlArray)
    .map(s ->
        s.replace("cse.wustl", "dre.vanderbilt"))
    .map(url -> { try { return new URL(url); }
                  catch (Exception ex) { ... } })
    .collect(toList());
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Checked exceptions are awkward!

See slieb.org/blog/throwable-interfaces

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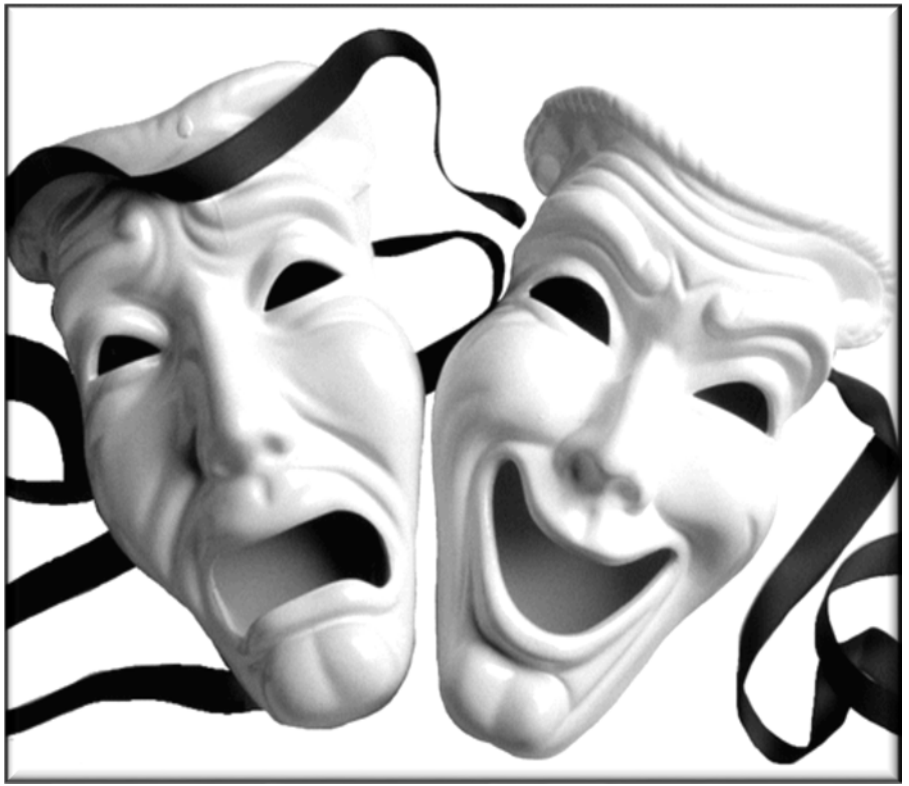
rethrowFunction() converts checked exception into runtime exception

See stackoverflow.com/a/27661504/3312330

External Iteration Versus Internal Iteration

- Advantages of internal iterators over external iterators



See www.javabrahman.com/java-8/java-8-internal-iterators-vs-external-iterators

External Iteration Versus Internal Iteration

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  - **Improved code readability**

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```

```
List<URL> urls =
  new ArrayList<URL>();
...
for (String url : urlArray)
  if (url.contains("cse.wustl"))
    urls.add(new URL(url.replace("cse.wustl",
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Focus on the "what" rather than the "how"

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- Advantages of internal iterators over external iterators
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  - **Transparent optimizations**

```
List<URL> urls = Stream
    .of(urlArray)
    .parallel()
    .filter(s -> s.contains("cse.wustl"))
    .map(s -> s.replace("cse.wustl",
                        "dre.vanderbilt"))
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List<URL> urls =
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  if (url.contains("cse.wustl"))
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Transparently run the stream in parallel

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  new ArrayList<URL>();
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  - **Fewer bugs**

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```

Doesn't split creation from initialization of collections

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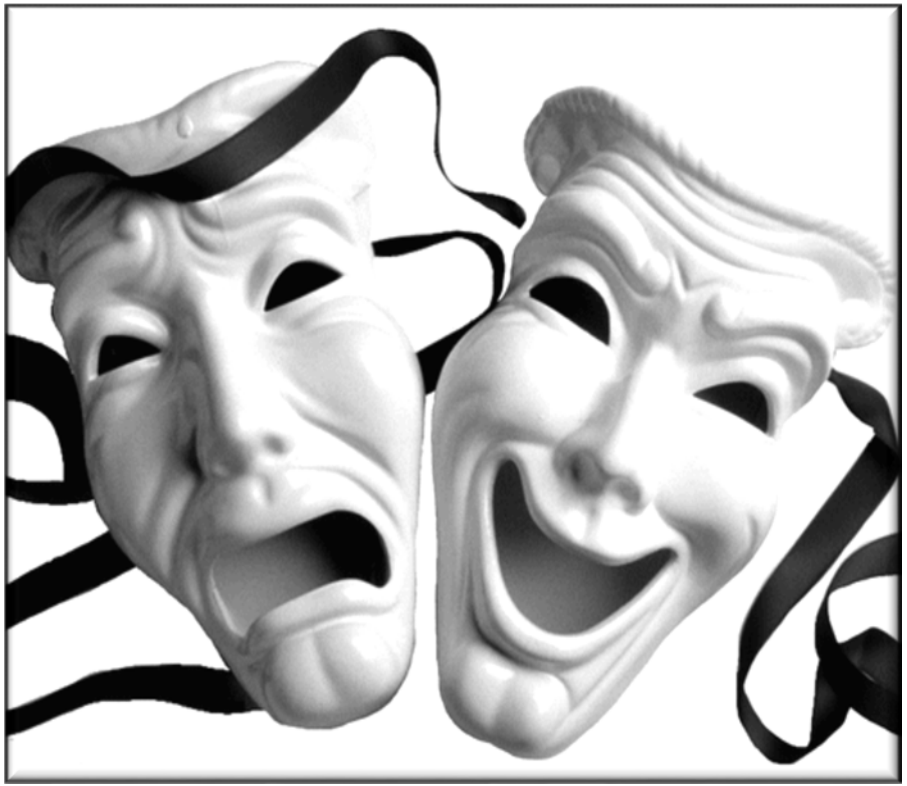

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  - **More control over iteration steps**

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    .collect(toList());
```

```
List<URL> urls =
  new ArrayList<URL>();
...
for (String url : urlArray)
  if (!url.contains("cse.wustl"))
    break;
  ...
```

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  - **More control over iteration steps**

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List<URL> urls =
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    break;
  ...
```

Exit a loop gracefully at an arbitrary point or handle errors more precisely

External Iteration Versus Internal Iteration

- Advantages of external iterators over internal iterators
  - More control over iteration steps
  - **Multiple active iterators**

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                        "dre.vanderbilt"))
    .map(rethrowFunction(URL::new))
    .collect(toList());
```

```
for (;;) {
  Iterator<URL>> iter1 = urls.iterator();
  Iterator<URL>> iter2 = urls.iterator();

  if (iter1.hasNext()) { URL url = iter1.next(); ... }
  if (iter2.hasNext()) { URL url = iter2.next(); ... }
  ...
```

Many iterators can be active over the same object

End of External Iteration vs. Internal Iteration