Overview of Java 8 Programming Paradigms

Douglas C. Schmidt
d.schmidt@vanderbilt.edu
www.dre.vanderbilt.edu/~schmidt

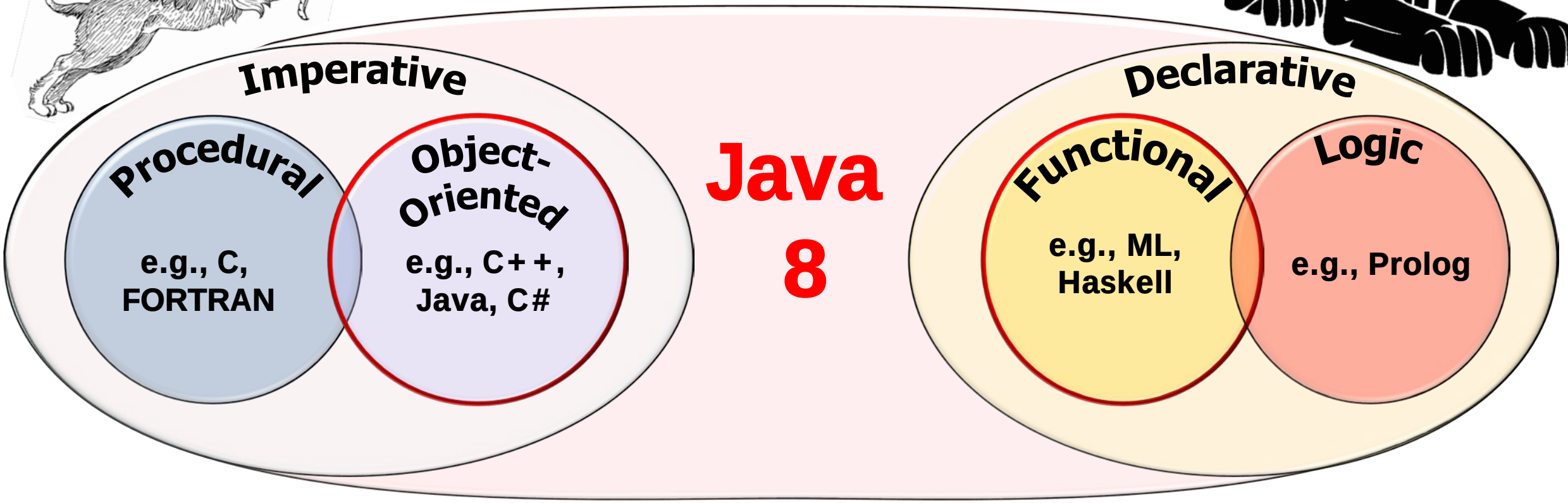
Professor of Computer Science

Institute for Software Integrated Systems

Vanderbilt University
Nashville, Tennessee, USA

Learning Objectives in this Lesson

- Understand key programming paradigms supported in Java 8



Overview of Programming Paradigms in Java 8

- Java 8 was released in March 2014

What's New in JDK 8

Java Platform, Standard Edition 8 is a major feature release. This document summarizes features and enhancements in Java SE 8 and in JDK 8, Oracle's implementation of Java SE 8. Click the component name for a more detailed description of the enhancements for that component.

- Java Programming Language
  - Lambda Expressions, a new language feature, has been introduced in this release. They enable you to treat functionality as a method argument, or code as data. Lambda expressions let you express instances of single-method interfaces (referred to as functional interfaces) more compactly.
  - Method references provide easy-to-read lambda expressions for methods that already have a name.
  - Default methods enable new functionality to be added to the interfaces of libraries and ensure binary compatibility with code written for older versions of those interfaces.
  - Repeating Annotations provide the ability to apply the same annotation type more than once to the same declaration or type use.
  - Type Annotations provide the ability to apply an annotation anywhere a type is used, not just on a declaration. Used with a pluggable type system, this feature enables improved type checking of your code.
  - Improved type inference.
  - Method parameter reflection.
- Collections
  - Classes in the new `java.util.stream` package provide a Stream API to support functional-style operations on streams of elements. The Stream API is integrated into the Collections API, which enables bulk operations on collections, such as sequential or parallel map-reduce transformations.
  - Performance Improvement for HashMaps with Key Collisions

See www.oracle.com/technetwork/java/javase/8-whats-new-2157071.html

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See docs.oracle.com/javase/tutorial/java/javaOO/lambdaexpressions.html

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

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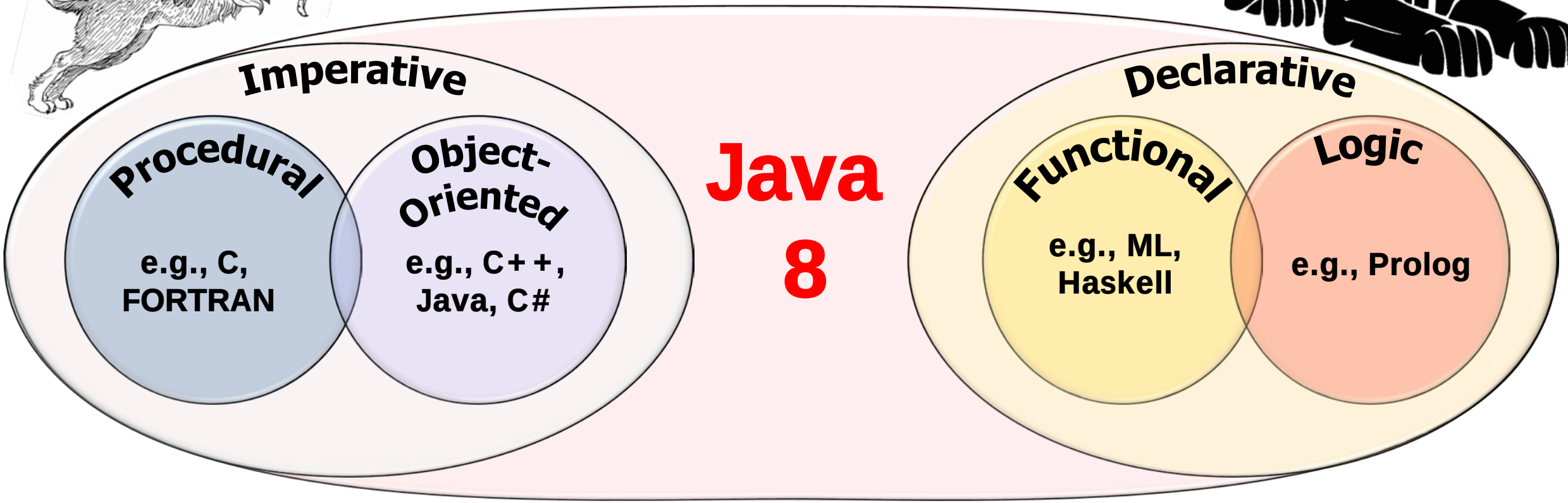
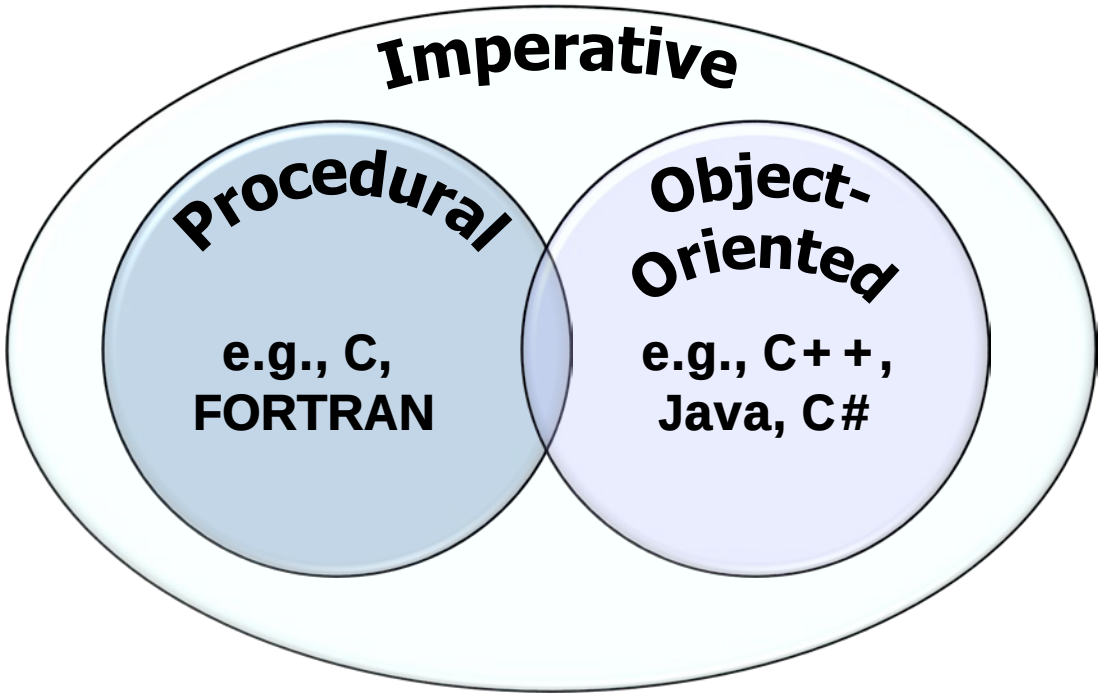
- Java 8 is a “hybrid” that combines the object-oriented & functional paradigms



See www.deadcoderising.com/why-you-should-embrace-lambdas-in-java-8

Overview of Programming Paradigms in Java 8

- Object-oriented programming is an “imperative” paradigm

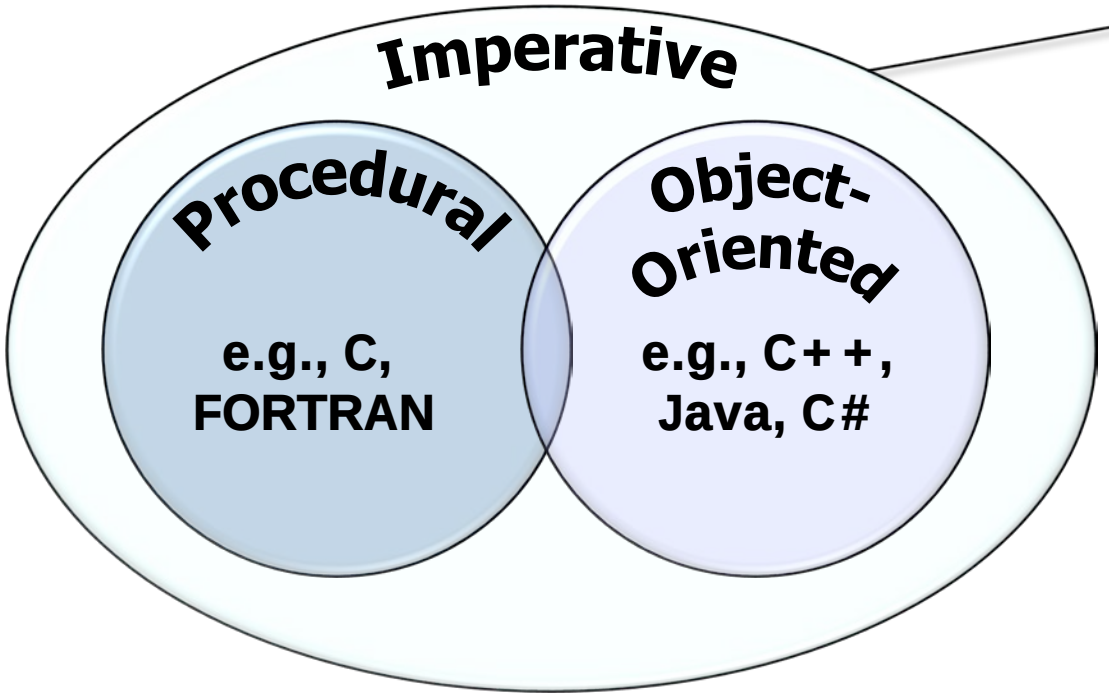


See en.wikipedia.org/wiki/Imperative_programming

Overview of Programming Paradigms in Java 8

- Object-oriented programming is an “imperative” paradigm
  - e.g., a program consists of commands for the computer to perform

Imperative programming focuses on describing how a program operates via statements that change its state



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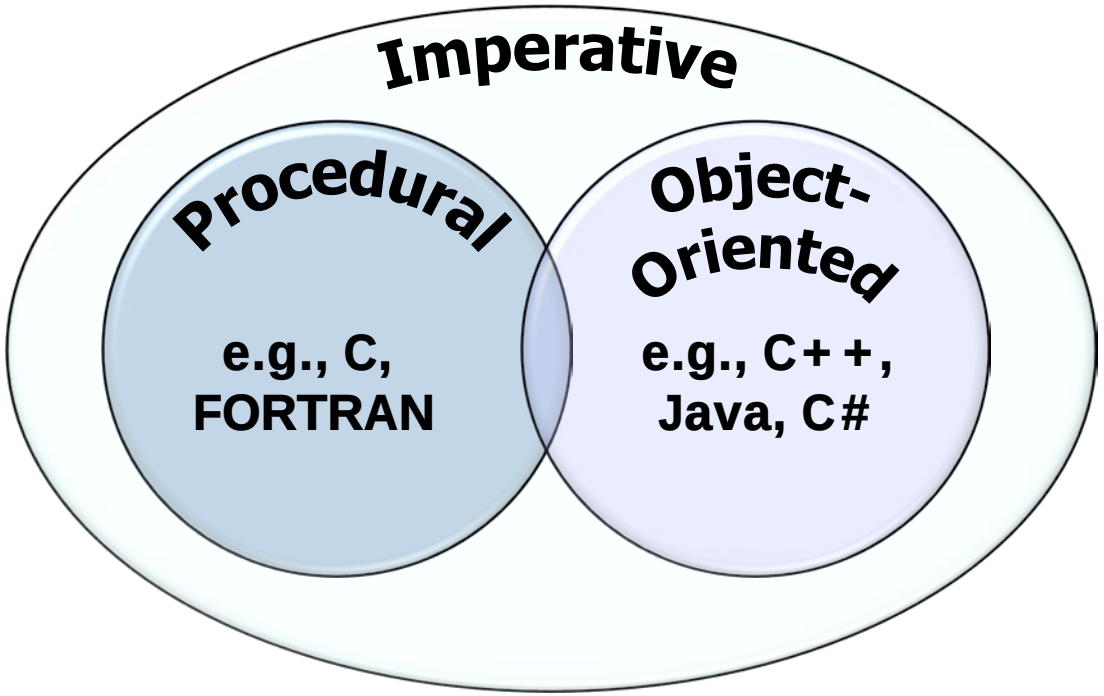


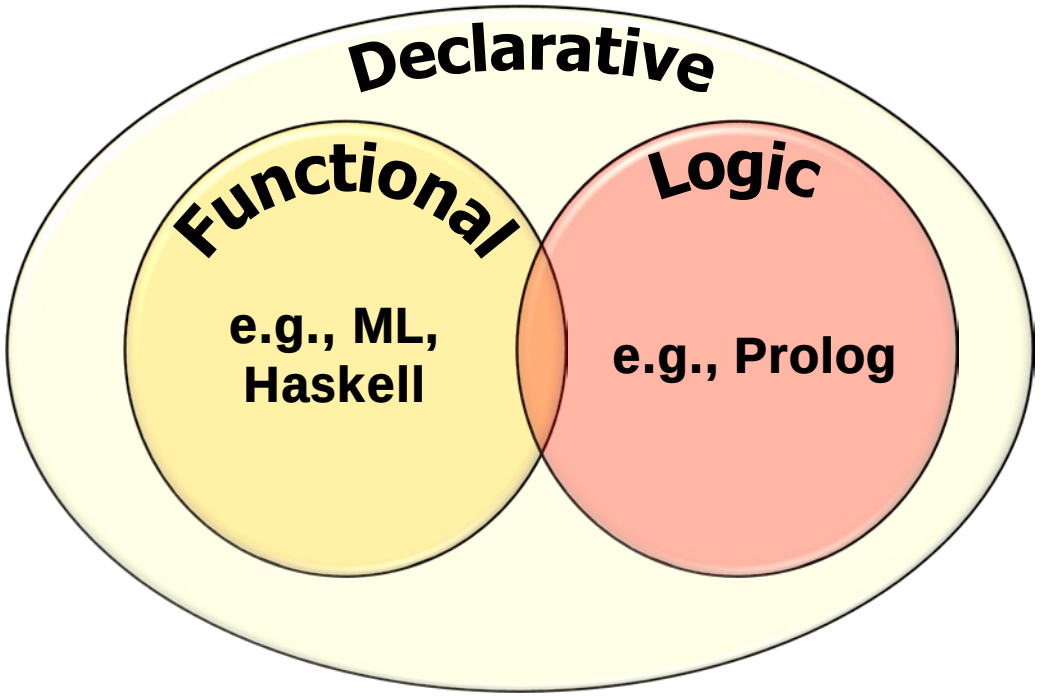

```
List<String> zap(List<String> lines,
                 String omit) {
  List<String> res =
    new ArrayList<>();
  for (String line : lines)
    if (!omit.equals(line))
      res.add(line);
  return res;
}
```

Imperatively remove a designated string from a list of strings

Note how this code is inherently sequential..

Overview of Programming Paradigms in Java 8

- Conversely, functional programming is a “declarative” paradigm

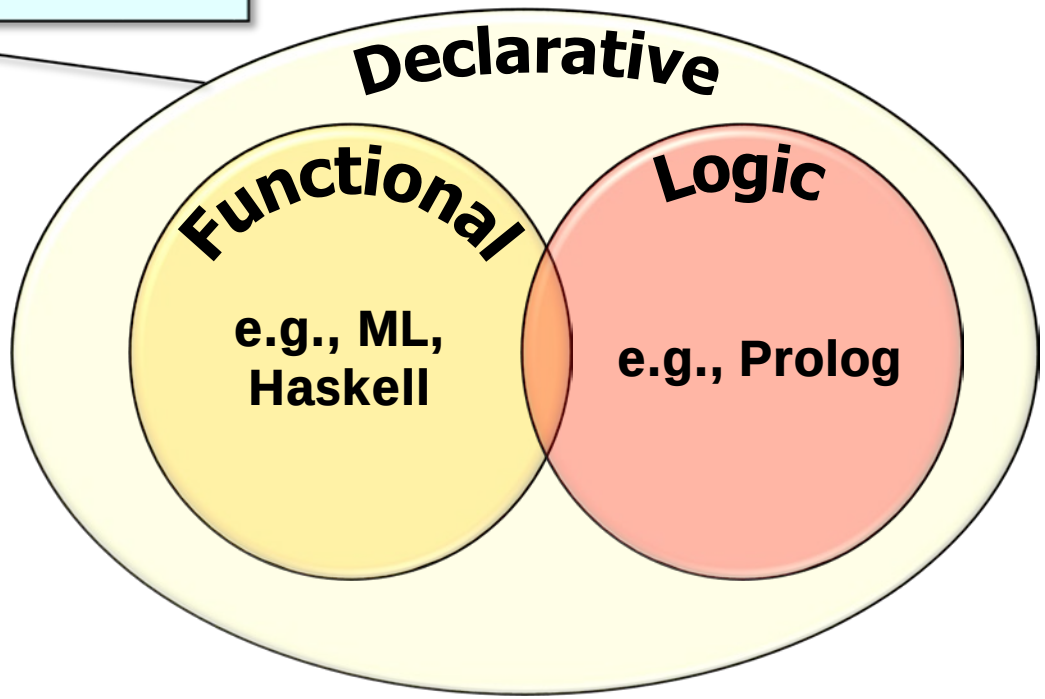


See en.wikipedia.org/wiki/Declarative_programming

Overview of Programming Paradigms in Java 8

- Conversely, functional programming is a “declarative” paradigm
  - e.g., a program expresses computational logic *without* describing control flow or explicit algorithmic steps

Declarative programming focuses on “what” computations to perform, not “how” to compute them



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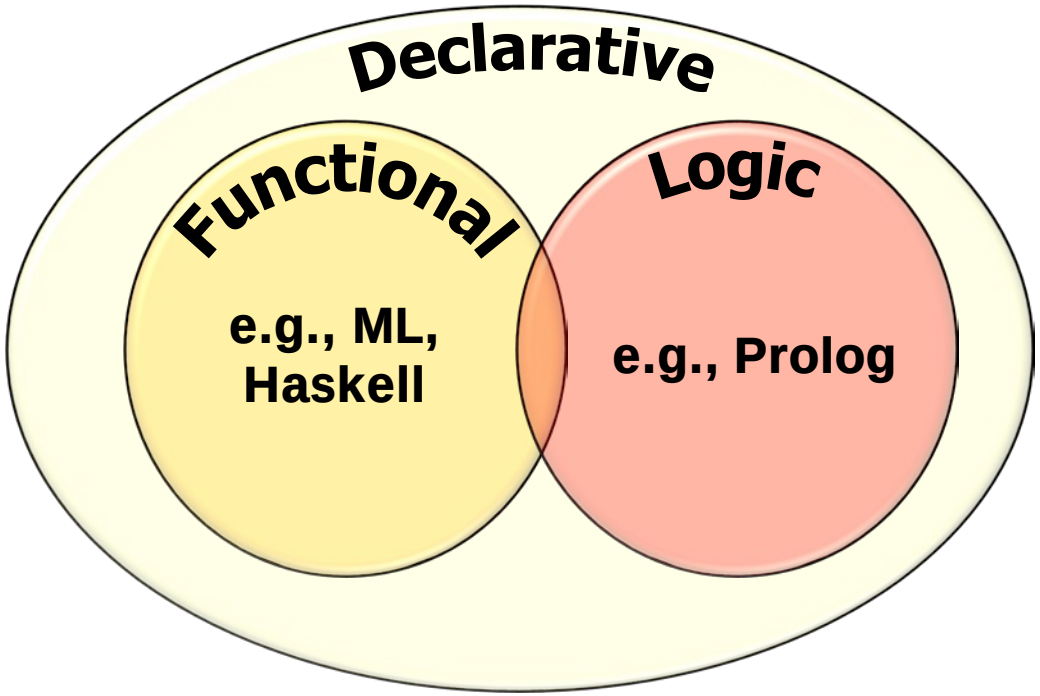
```
List<String> zap(List<String> lines,
                 String omit) {
  return lines
    .stream()
    .filter(line ->
            !omit.equals(line))
    .collect(toList());
}
```

Declaratively remove a designated string from a list of strings



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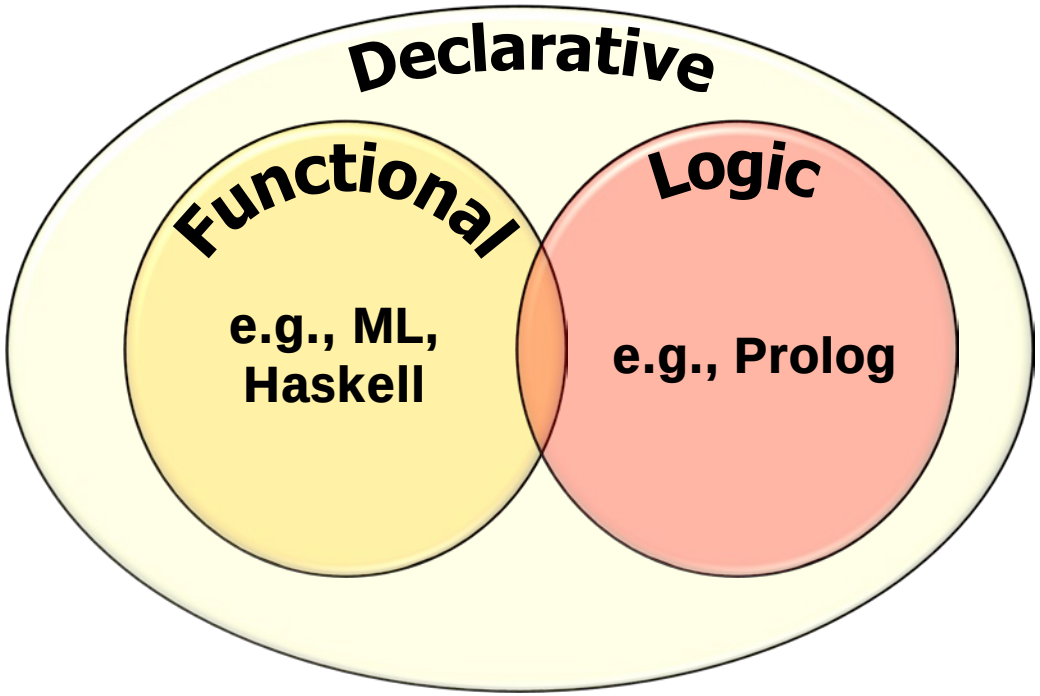
Note “fluent” programming style with cascading method calls



See en.wikipedia.org/wiki/Fluent_interface

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```
List<String> zap(List<String> lines,
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    .parallelStream()
    .filter(line ->
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    .collect(toList());
}
```
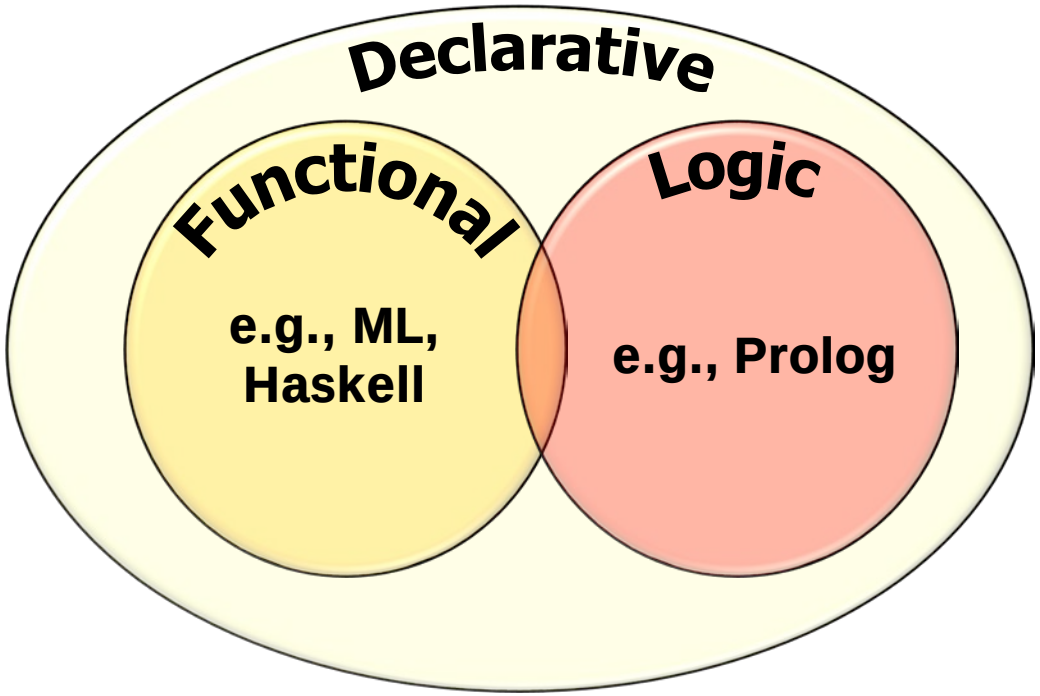

Perform filtering in parallel



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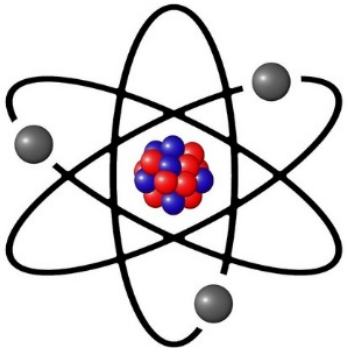

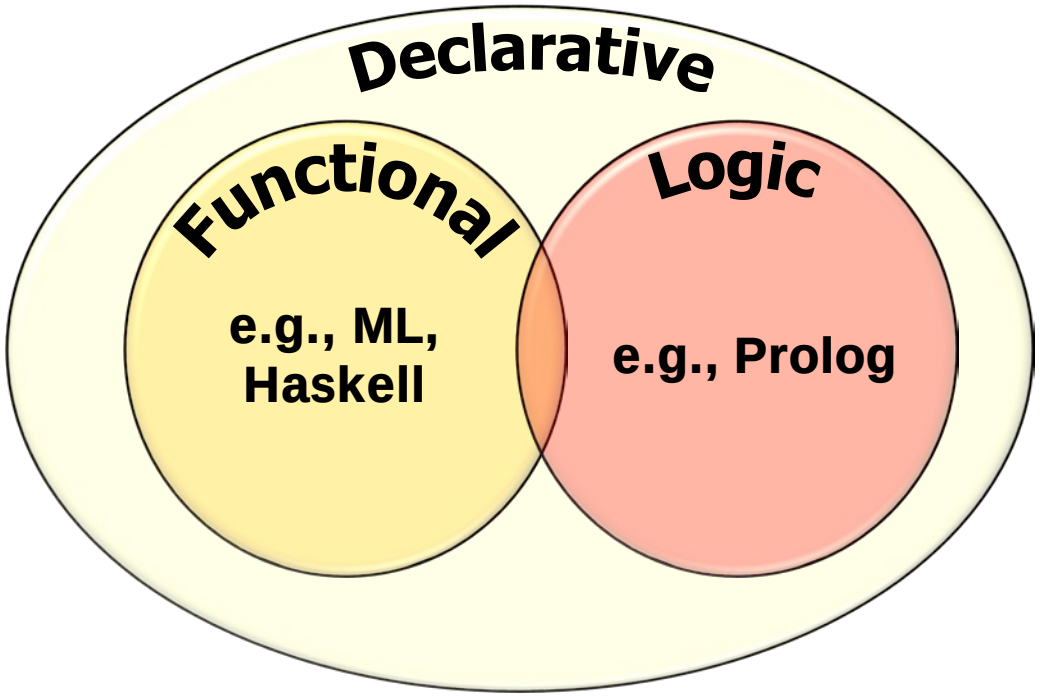

Note how this code is can be parallelized with miniscule changes..

End of Overview of Java 8