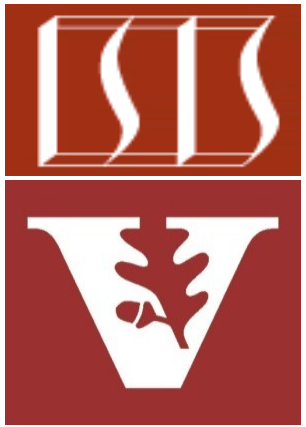
Java Parallel Streams Internals: Order of Processing Overview

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 Part of the Lesson

- Understand parallel stream internals, e.g.
  - Know what can change & what can't
    - Splitting, combining, & pooling mechanisms
    - Order of processing

Java Parallel Stream Processing Order

Java Parallel Stream Processing Order

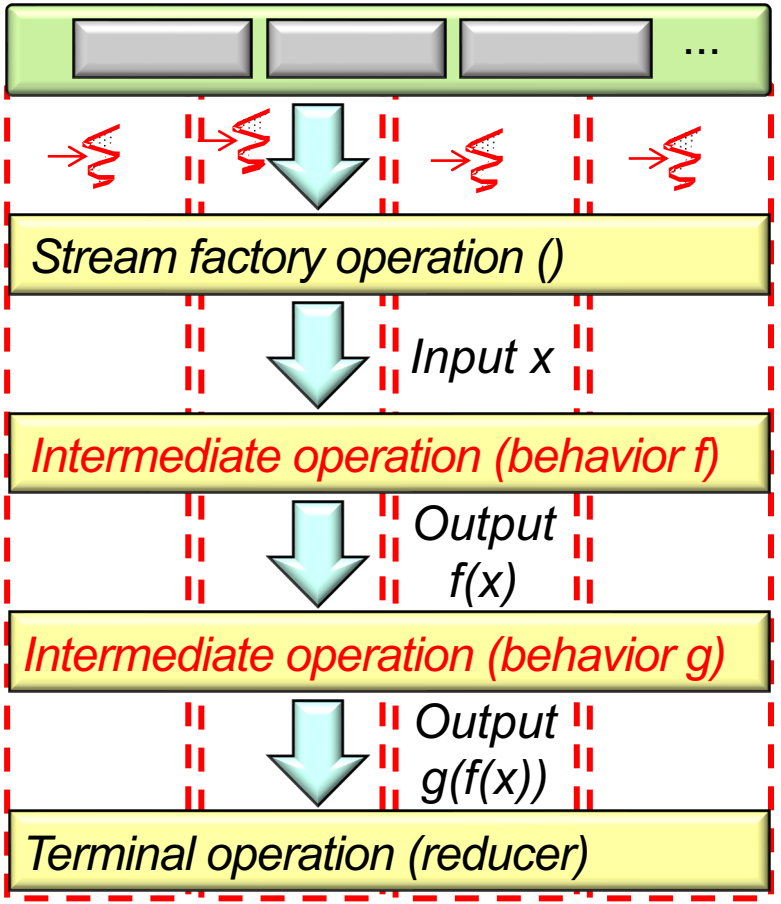
- The Java parallel streams framework allows for variability in the order of its processing, while still being deterministic in the processing results

Non-deterministic processing order

Deterministic processing results

Java Parallel Stream Processing Order

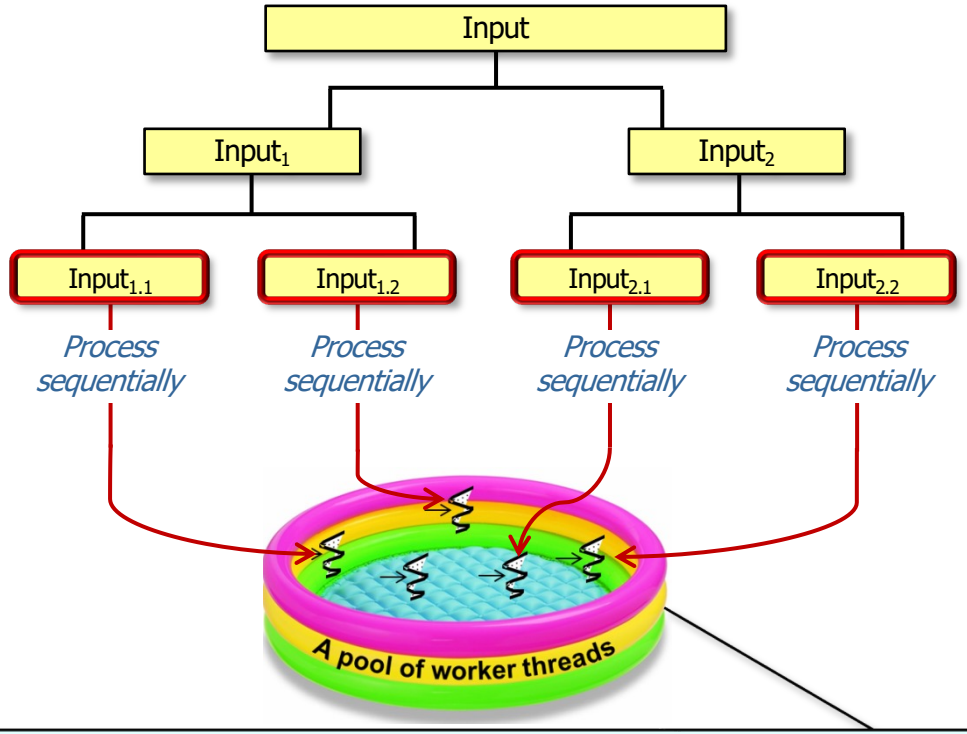
- The *order* in which chunks in a parallel stream are processed is non-deterministic

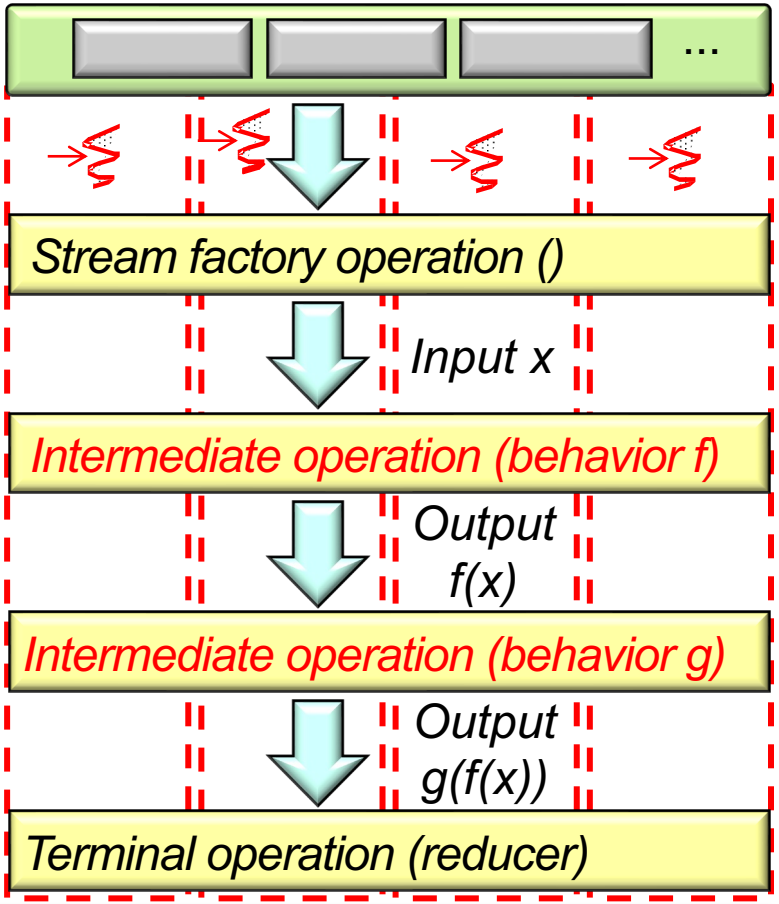


See en.wikipedia.org/wiki/Nondeterministic_algorithm

Java Parallel Stream Processing Order

- The *order* in which chunks in a parallel stream are processed is non-deterministic

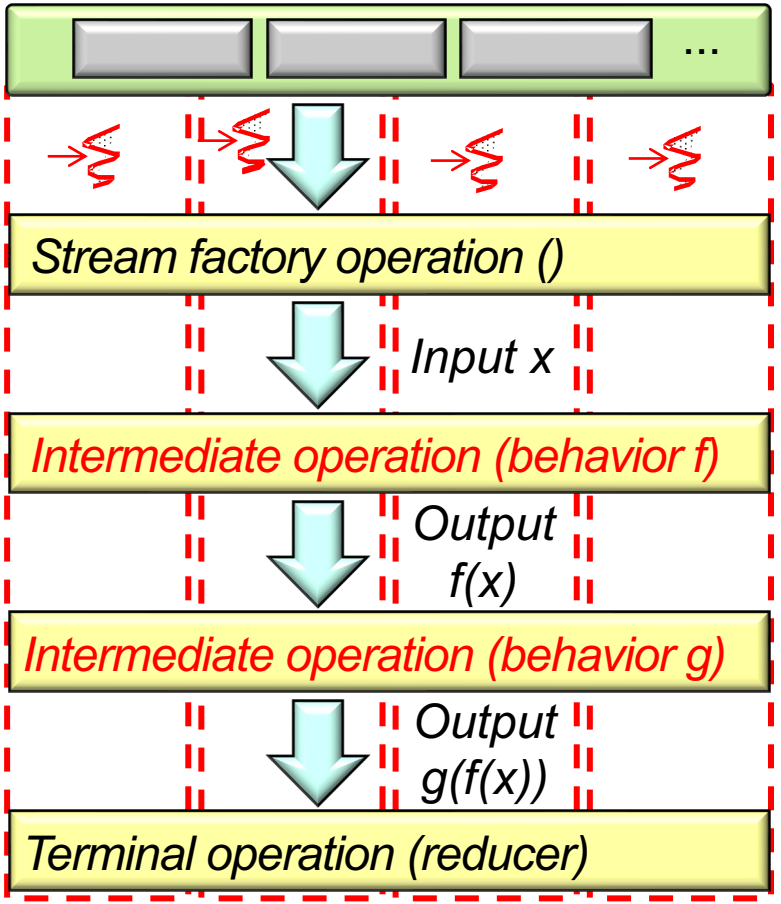




The ordering can exhibit different behaviors on different runs, even for the same input

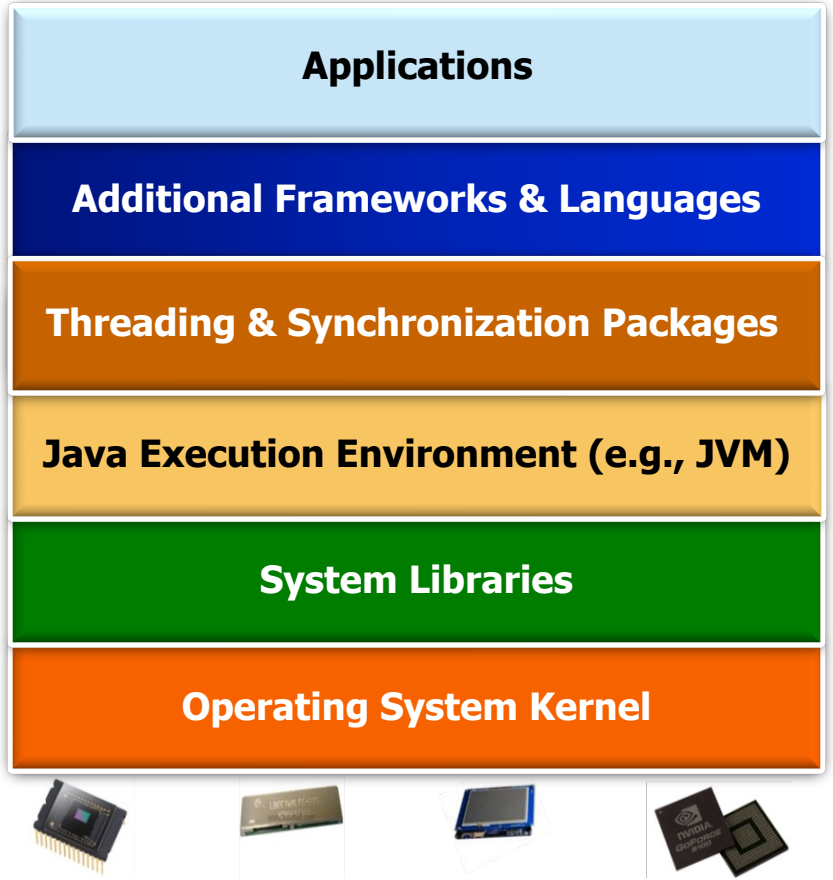
Java Parallel Stream Processing Order

- The *order* in which chunks in a parallel stream are processed is non-deterministic
  - Programmers have little/no control over how chunks are processed



Java Parallel Stream Processing Order

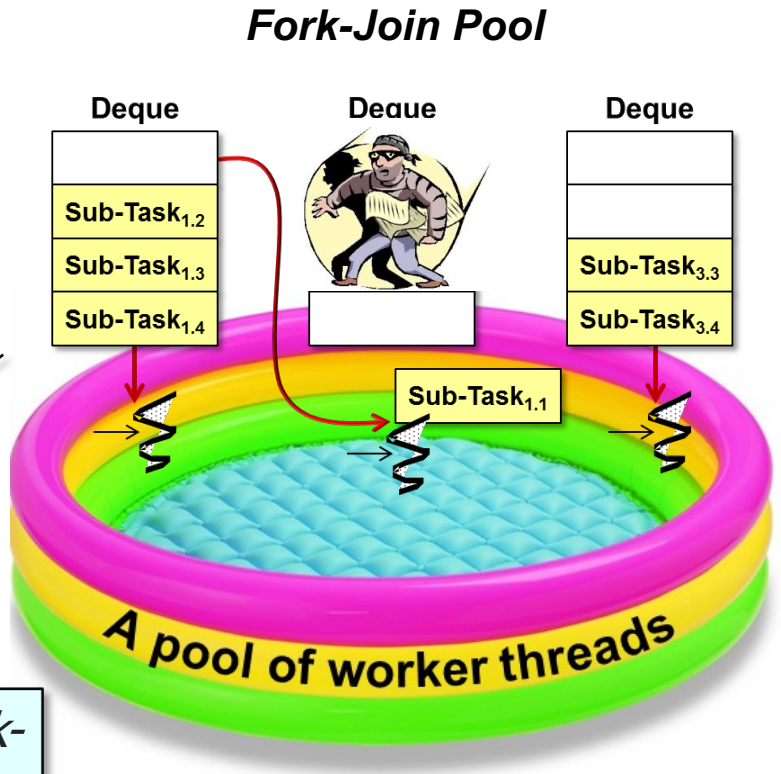
- The *order* in which chunks in a parallel stream are processed is non-deterministic
  - Programmers have little/no control over how chunks are processed
  - Non-determinism enables optimizations at multiple layers!



e.g., scheduling & execution of tasks via fork-join pool, JVM, hardware cores, etc.

Java Parallel Stream Processing Order

- The *order* in which chunks in a parallel stream are processed is non-deterministic
  - Programmers have little/no control over how chunks are processed
  - Non-determinism enables optimizations at multiple layers!



e.g., fork-join framework's support for work-stealing is a non-deterministic optimization

See upcoming lessons on "*The Java Fork-Join Framework*"

End of Java Parallel Streams Internals: Order of Processing Overview