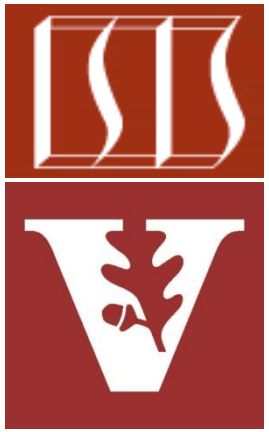
Java Monitor Objects: Motivating Example



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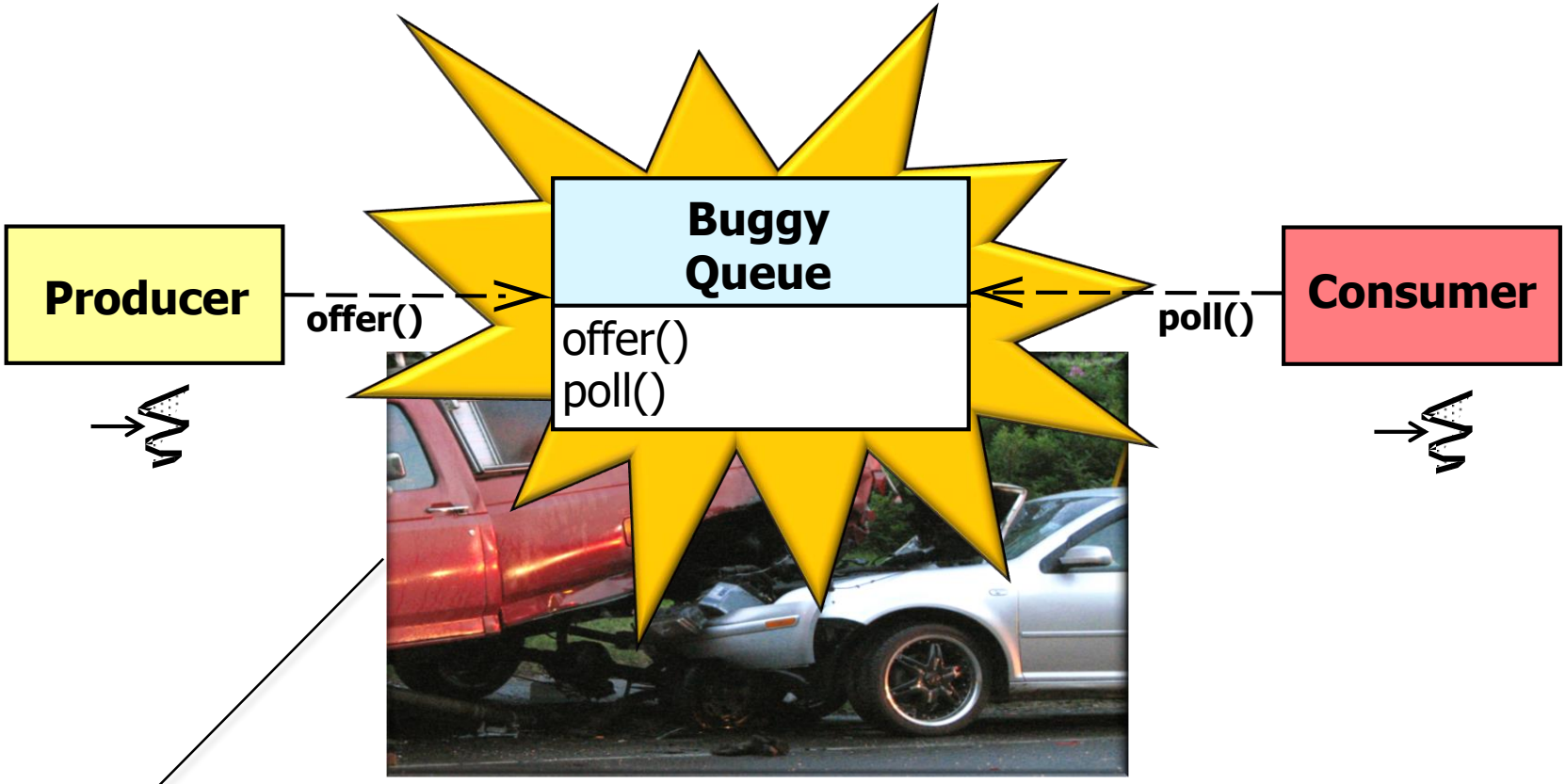
Learning Objectives in this Part of the Lesson

- Understand what monitors are & know how Java built-in monitor objects can ensure mutual exclusion & coordination between threads
- Note a human-known use of monitors
- Recognize common synchronization problems in concurrent Java programs

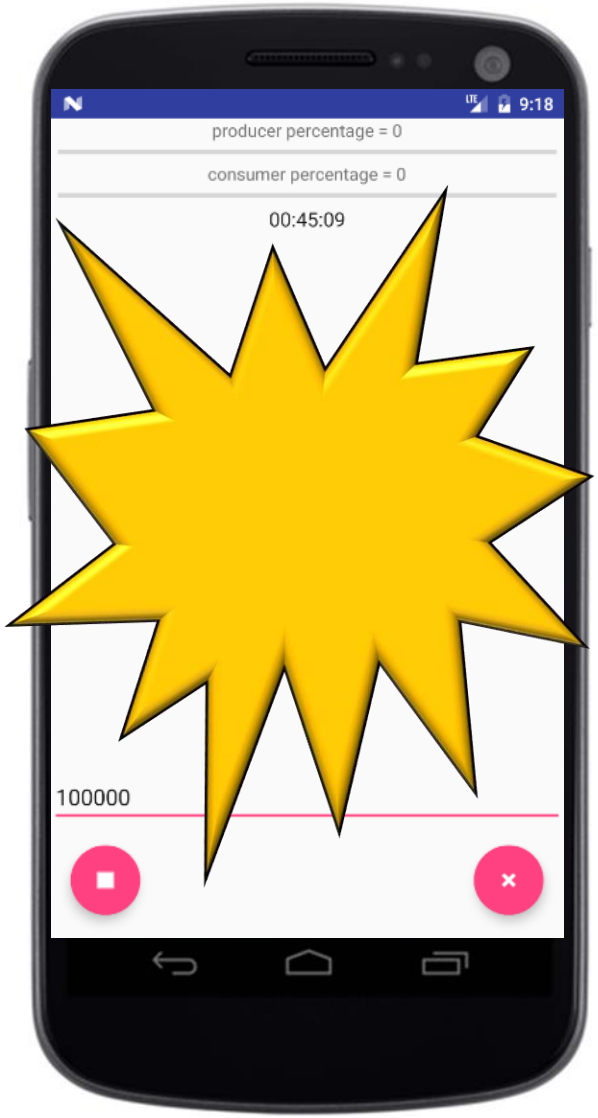


Concurrent calls to offer() & poll() corrupt internal state in the BuggyQueue fields

A Buggy Producer/ Consumer App

A Buggy Producer/Consumer App

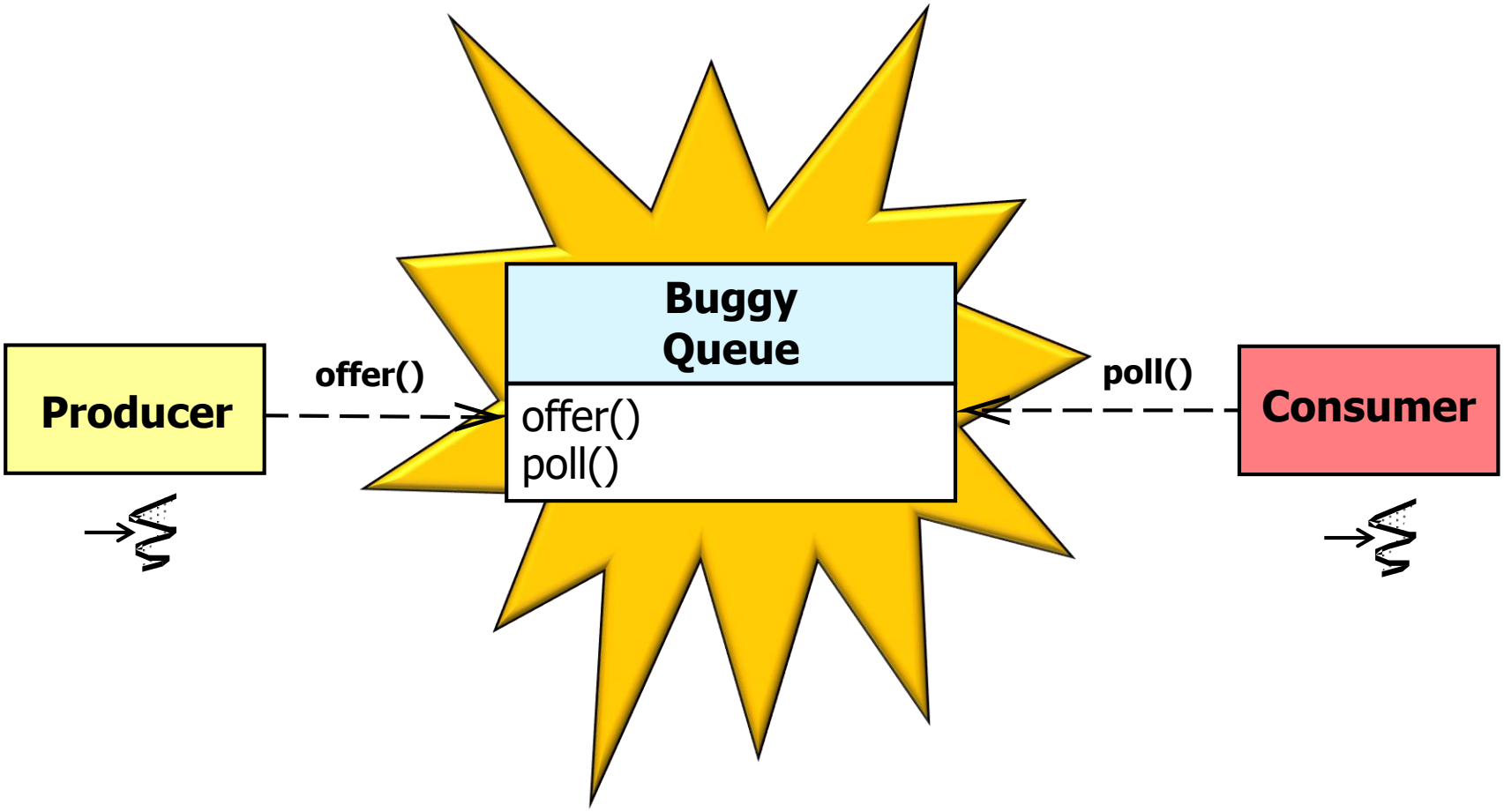
- A concurrent producer/consumer app that attempts to pass messages via an "BuggyQueue" class



See github.com/douglascraigschmidt/POSA/tree/master/ex/M3/Queues/BuggyQueue

A Buggy Producer/Consumer App

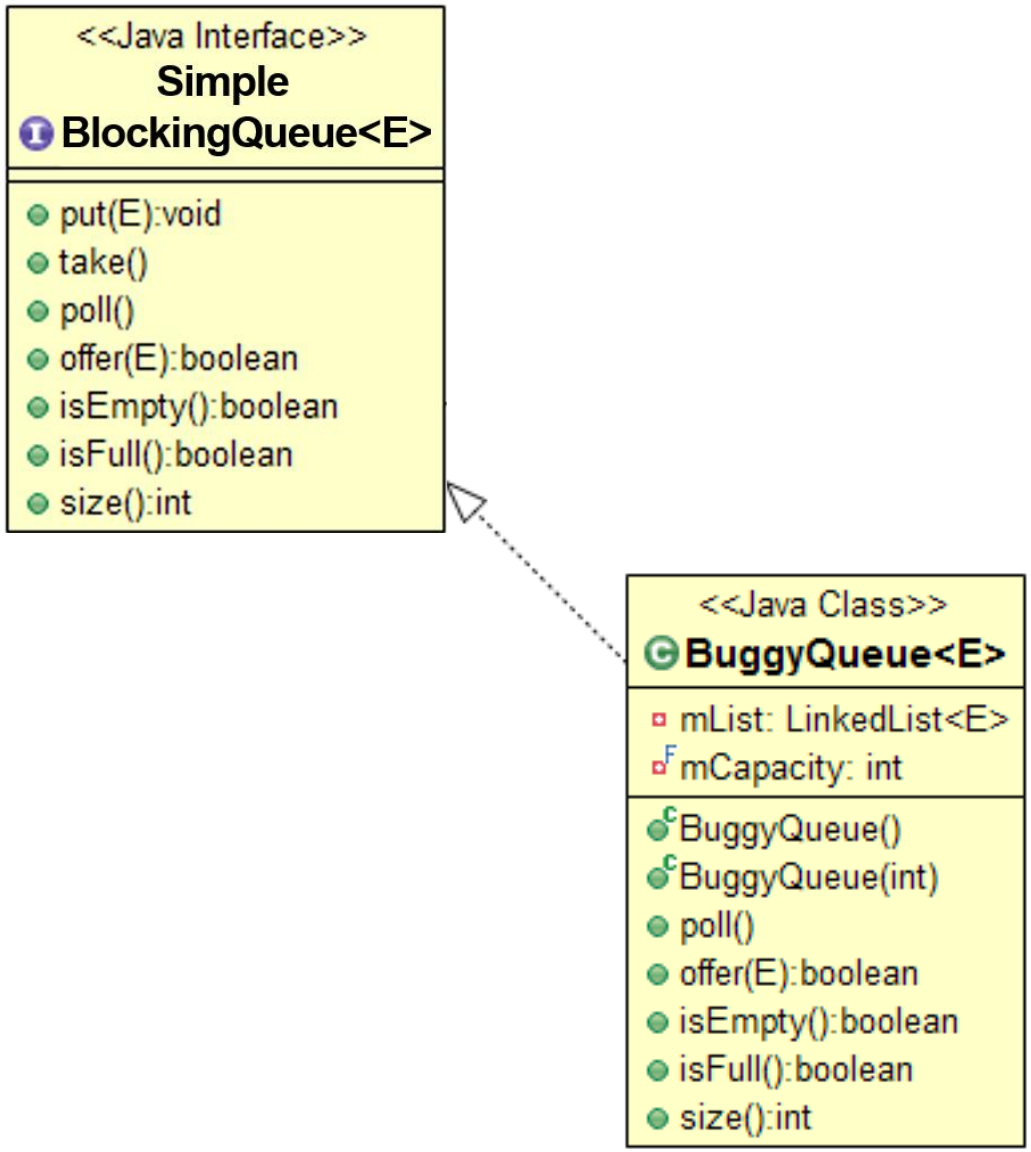
- The BuggyQueue class is modeled on the Java ArrayBoundedQueue class



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

A Buggy Producer/Consumer App

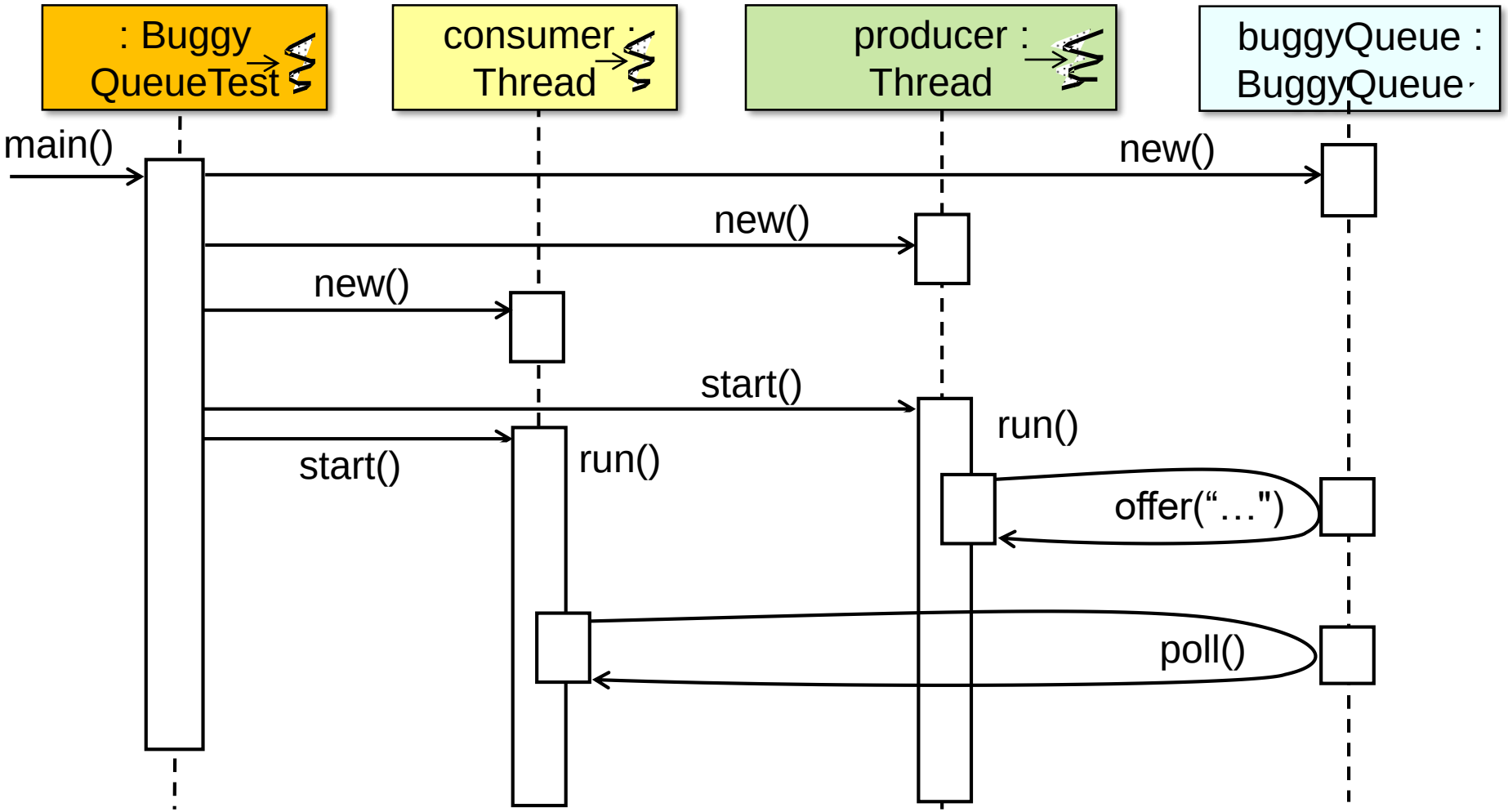
- UML class diagram showing the design of the BuggyQueue



See github.com/douglascraigschmidt/POSA/tree/master/ex/M3/Queues/BuggyQueue/app/src/main/java/edu/vandy/buggyqueue/model

A Buggy Producer/Consumer App

- UML sequence diagram of the BuggyQueue producer/consumer unit test



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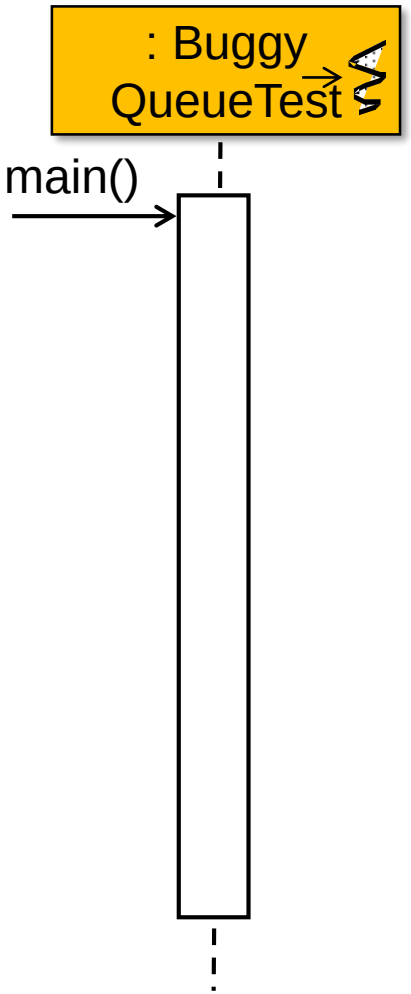

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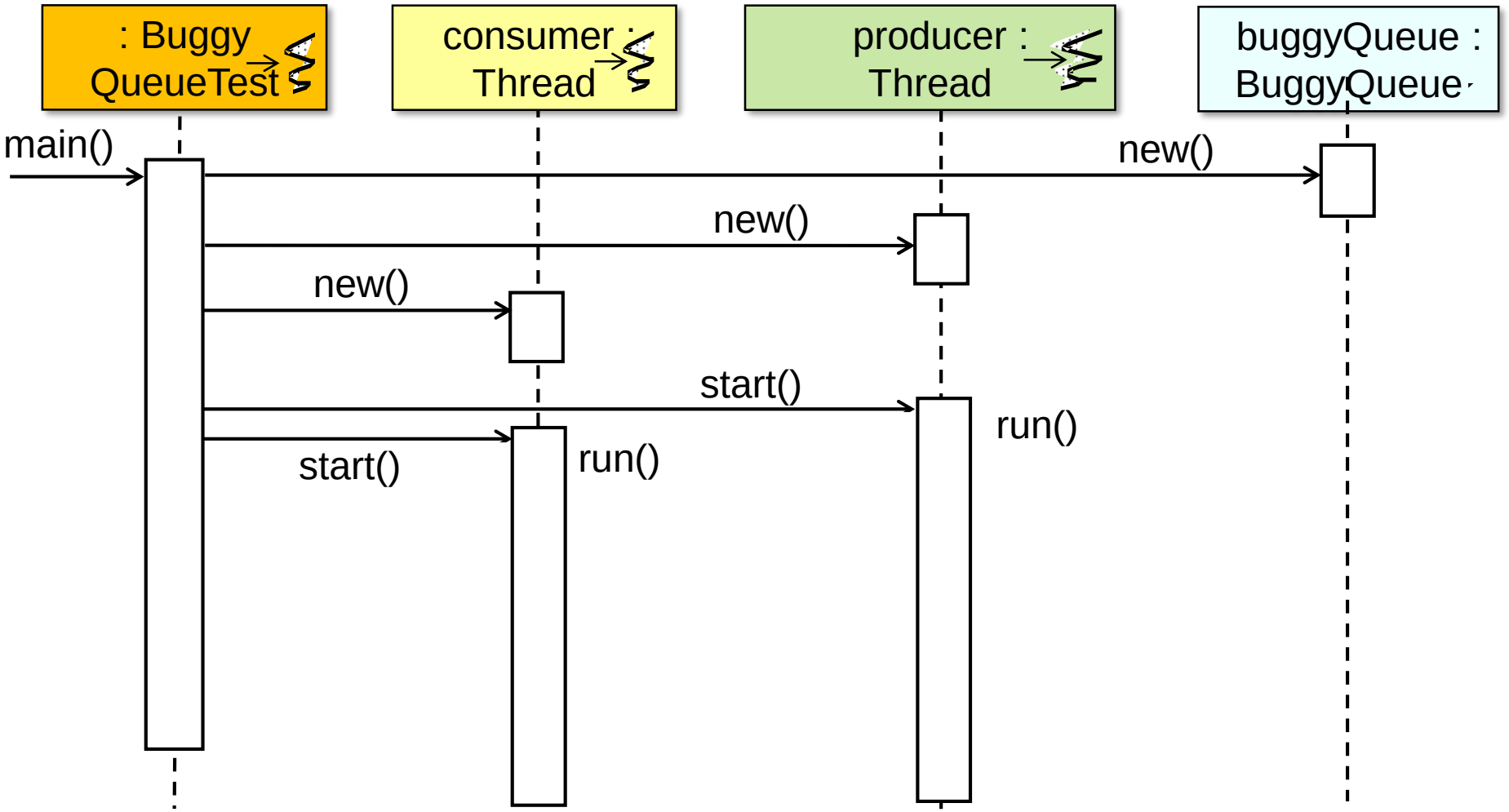

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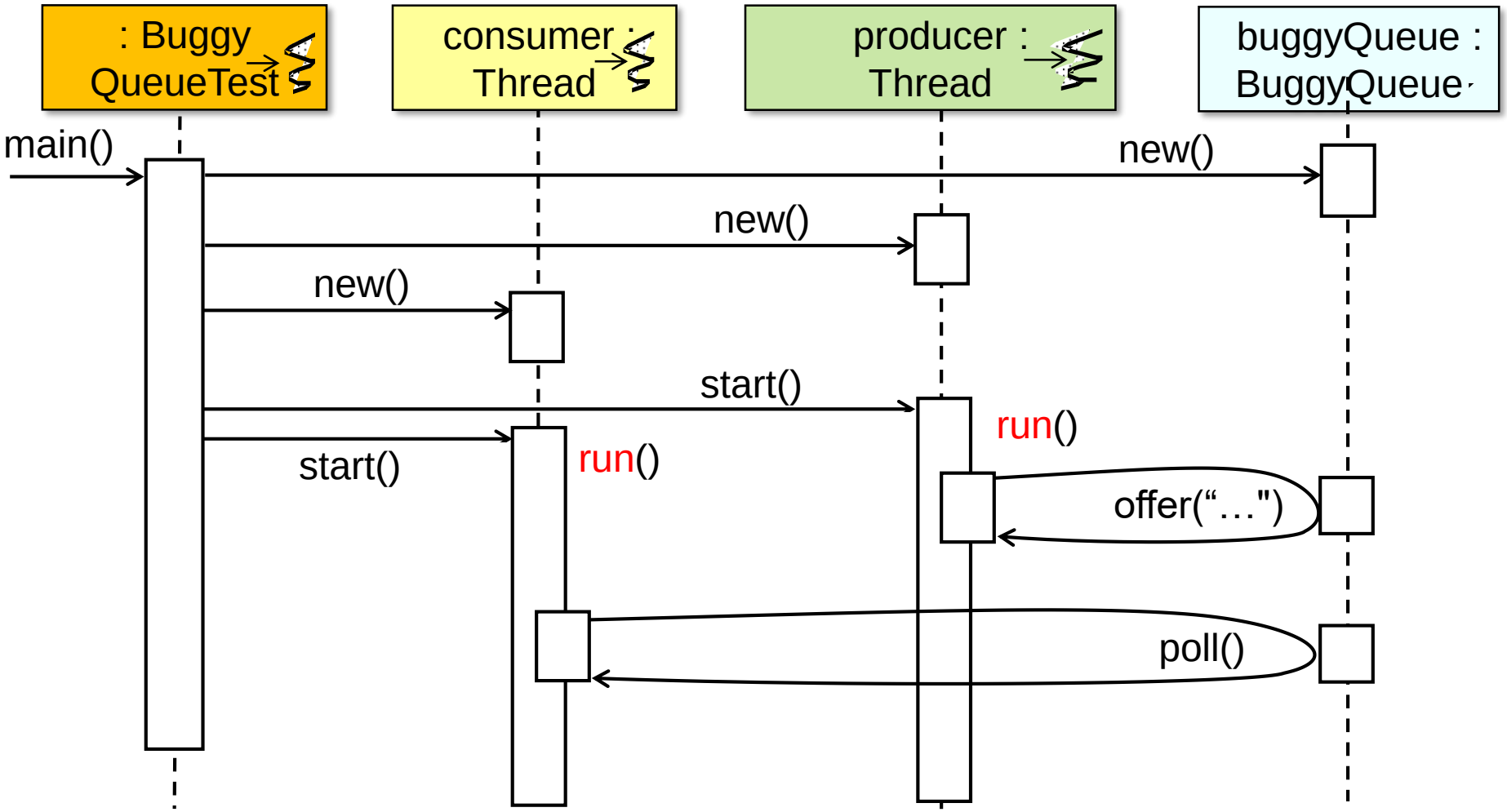

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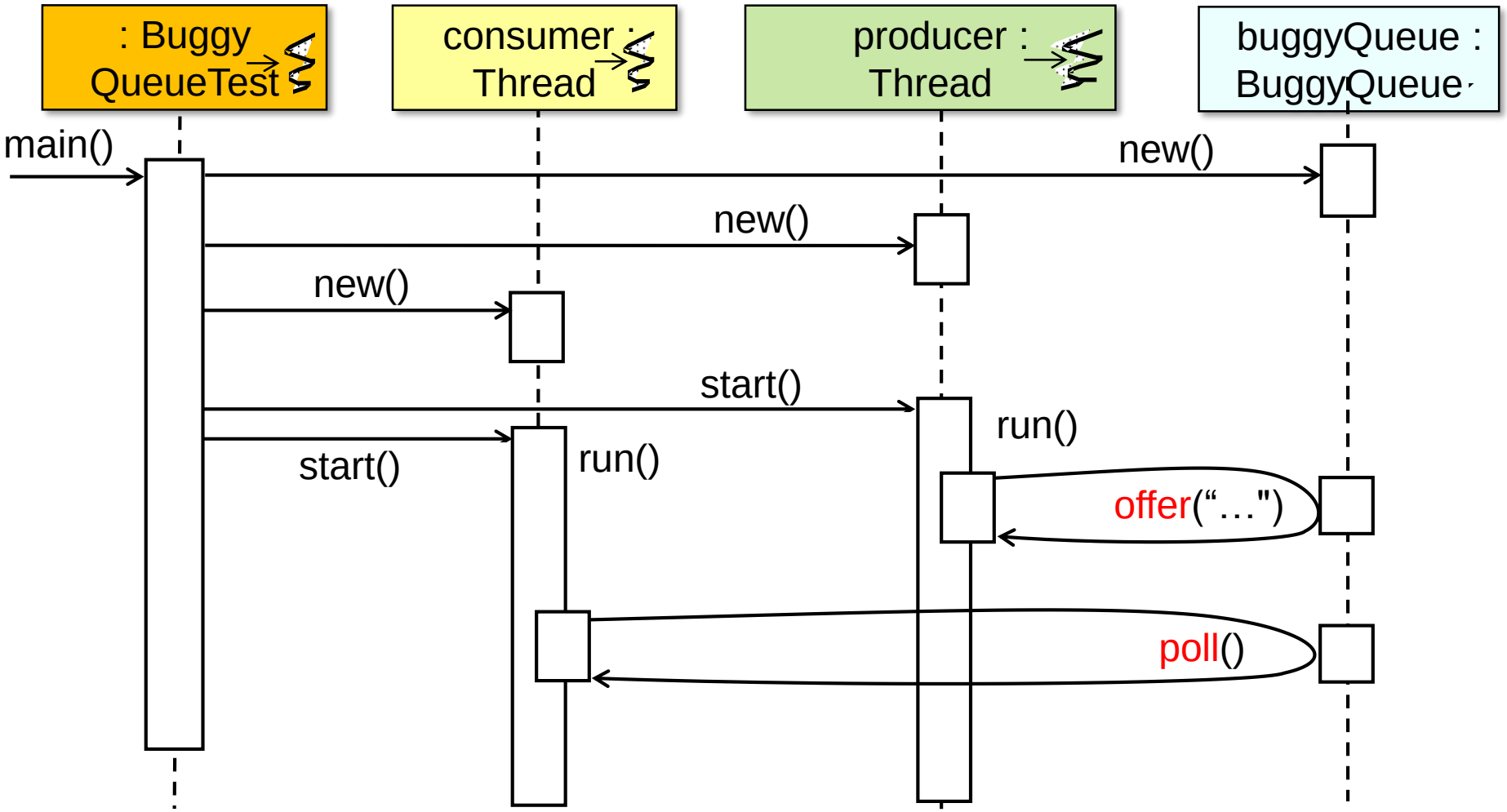


Since the offer() & poll() methods aren't synchronized chaos & insanity will result when this app & unit test is run!!

The BuggyQueue Implementation

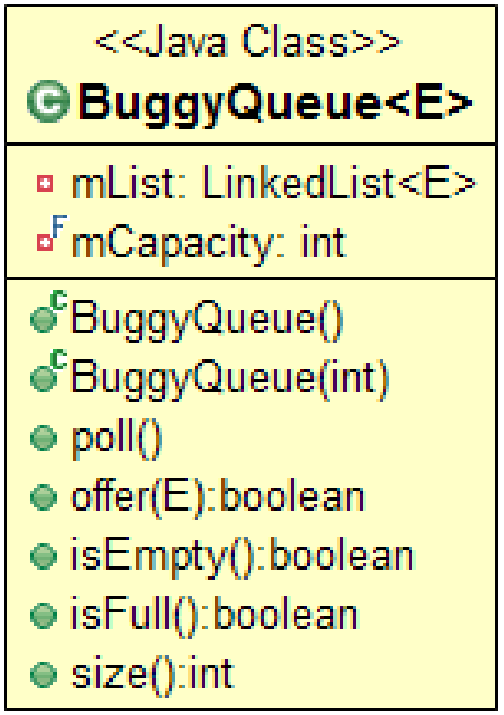
The BuggyQueue Implementation

- The BuggyQueue class is a simply wrapper around Java's LinkedList class

```
static class BuggyQueue<E> implements SimpleBlockingQueue<E> {
  private LinkedList<E> mList = new LinkedList<>(); ...

  public void offer(E e) {
    if (!isFull())
    { mList.add(e); return true; }
    else
      return false;
  }


  public E poll() {
    if (!isEmpty())
       return mList.remove(0);
    else
       return null;
  }
...
```



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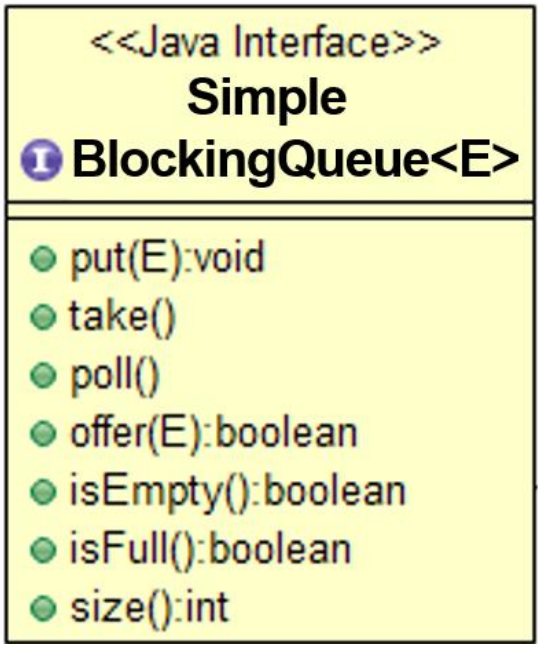

This interface is a variant of what's available in Java's BlockingQueue interface

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Linked list implementation

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

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Non-synchronized public methods

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Add & remove elements into/from the queue

See en.wikipedia.org/wiki/Robot_B-9

End of Java Monitor Objects: Motivating Example