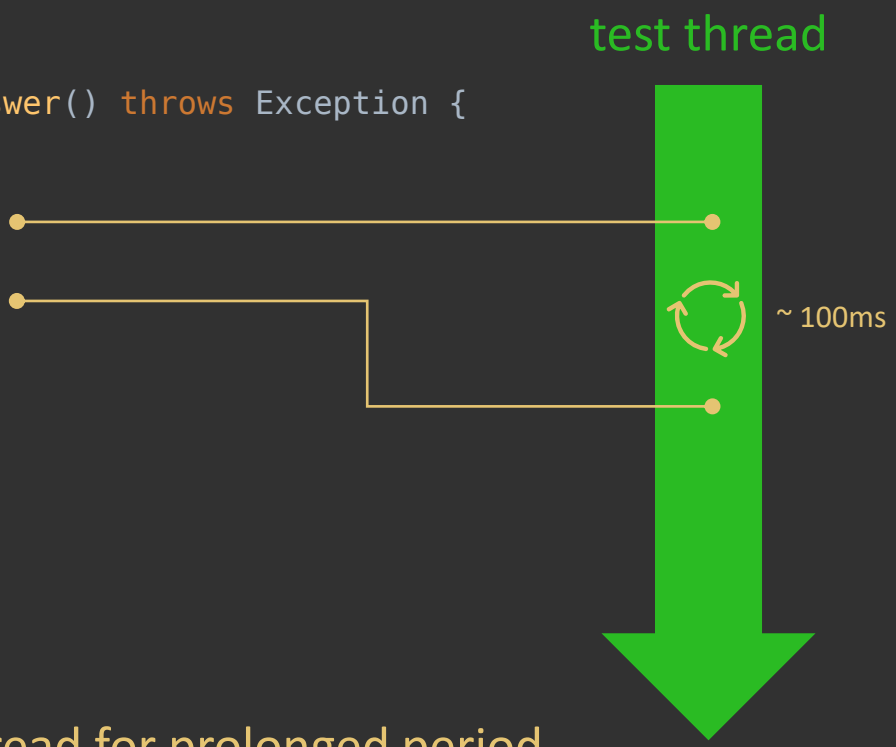
Structured Concurrency

From Unit Testing Challenges to Structured Concurrency

Synchronous implementation:

```java
@Test
public void computeFibonacci_10_returnsCorrectAnswer() throws Exception {
    // Arrange
    // Act
    BigInteger result = SUT.computeFibonacci(10);
    // Assert
    assertThat(result, is(new BigInteger("55")));
}
```

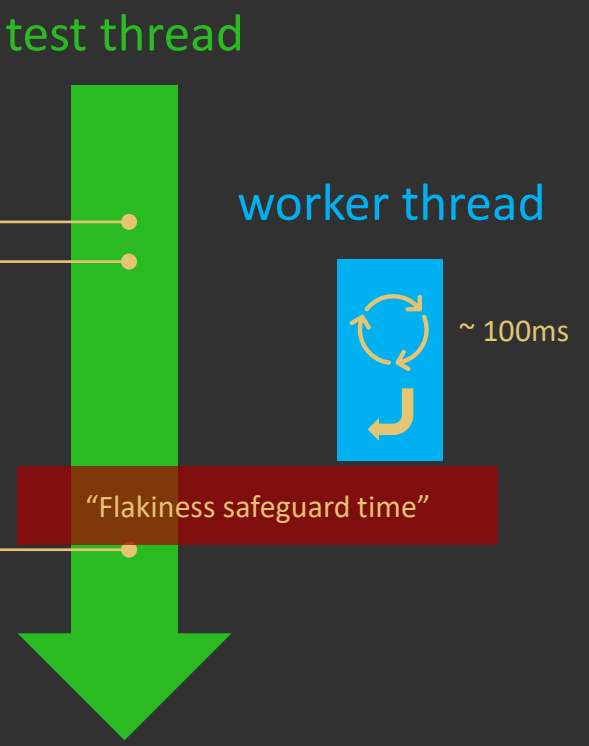


Pros: simple to unit test

Cons: production code blocks the calling thread for prolonged period

Concurrent implementation with async callback:

```
@Test
public void computeFibonacci_10_returnsCorrectAnswer() throws Exception {
    // Arrange
    // Act
    SUT.computeFibonacci(10, mCallback);
    Thread.sleep(200);
    // Assert
    assertThat(lastResult, is(new BigInteger("55")));
}
```

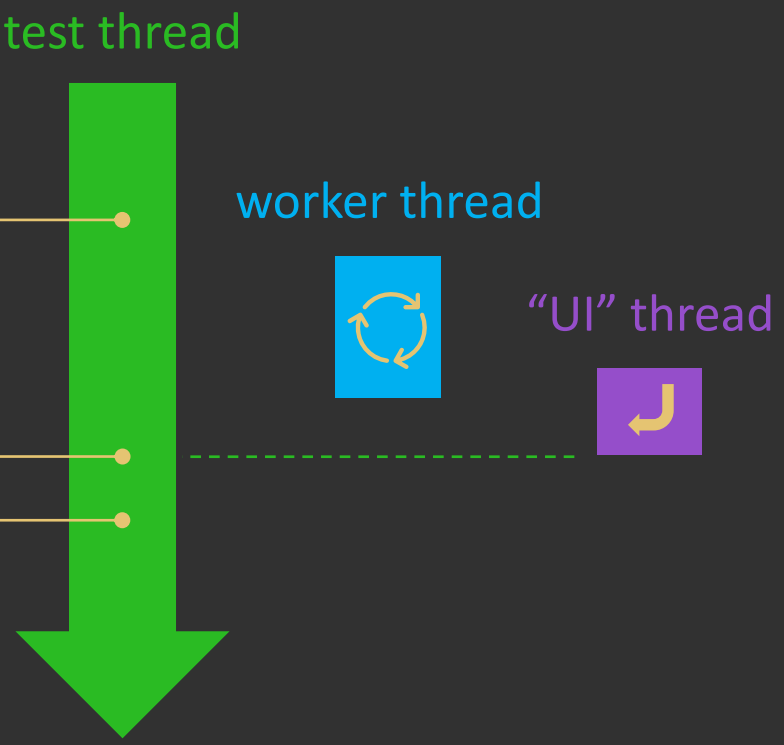


Pros: production code doesn’t block the calling thread

Cons: flaky unit test which takes too much time to execute due to “flakiness safeguard time”; callback invoked on the worker thread

Concurrent implementation with async callback using ThreadPoster:

```
@Test
public void computeFibonacci_10_returnsCorrectAnswer() throws Exception {
    // Arrange
    // Act
    SUT.computeFibonacci(10, mCallback);
    mThreadPostersTestDouble.join();
    // Assert
    assertThat(lastResult, is(new BigInteger("55")));
}
```



Pros: production code doesn't block the calling thread; no time overhead; relatively simple

Cons: requires developers to follow additional conventions

Concurrent implementation with async callback using ThreadPoster:

```
@Test
public void computeFibonacci_10_returnsCorrectAnswer() throws Exception {
    // Arrange
    // Act
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}
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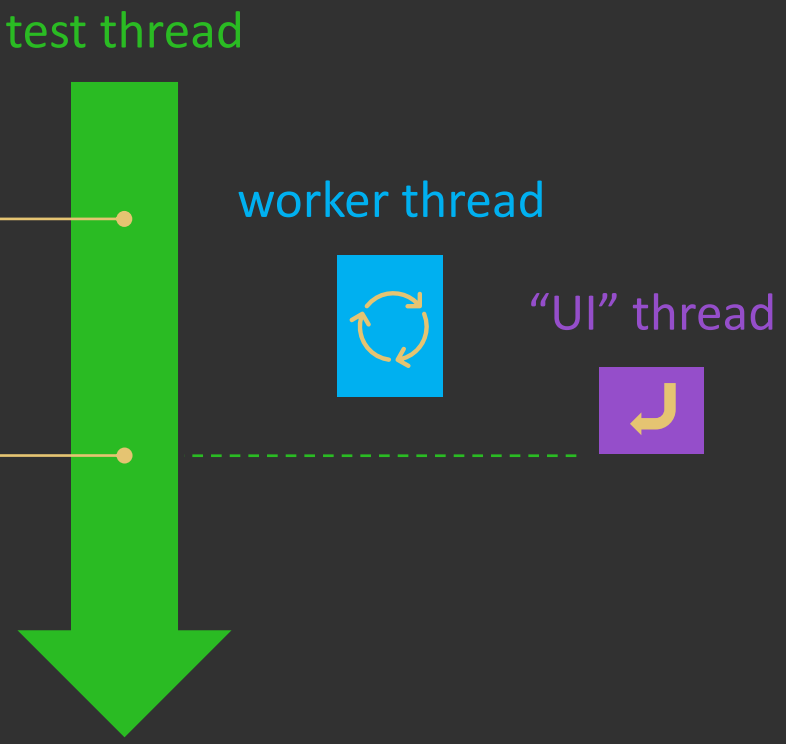

`.join()` functionality: do not proceed with execution (block calling thread) until all flows, including the concurrent ones, complete

➡ **Structured Concurrency!**

Structured Concurrency:

an ability to “pause” code execution and “wait” for all concurrent flows which can be traced back to a specific “ancestor” to complete

ThreadPoster provides very basic support for Structured Concurrency in unit tests

Kotlin Coroutines provide advanced support for Structured Concurrency everywhere

Structured Concurrency Summary

Structured Concurrency using ThreadPoster:

```
@Test
public void computeFibonacci_10_returnsCorrectAnswer() throws Exception {
    // Arrange
    // Act
    SUT.computeFibonacci(10, mCallback);
    mThreadPostersTestDouble.join();
    // Assert
    assertThat(lastResult, is(new BigInteger("55")));
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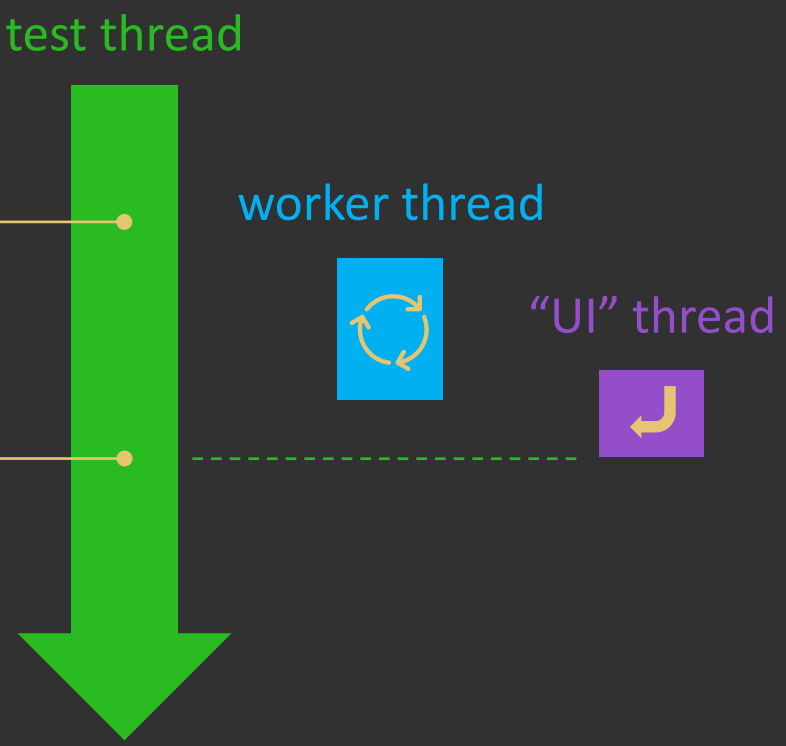

Structured Concurrency:

an ability to “pause” code execution and “wait” for all concurrent flows which can be traced back to a specific “ancestor” to complete

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Does Structured Concurrency make concurrent code safer?

I don’t think so!

Structured Concurrency allows for more straightforward implementation of some concurrent flows