

Testing Concurrent Java programs

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AGENDA

- What makes Concurrent programs hard to test.
- How concurrent application's design drives testability.
- Testing asynchronous code - demo.
- Testing Blocking operations and Resource Management - demo.
- Testing Thread Safety - demo.
- Complementary testing approaches.
- Questions & Feedback



What makes concurrency hard to test

Tests for Concurrent Programs are themselves concurrent programs.

Failures are rare and probabilistic in nature.

Execution is Platform Dependent.



Design and Testability

Encapsulating concurrent interactions .

Thread Delegation.

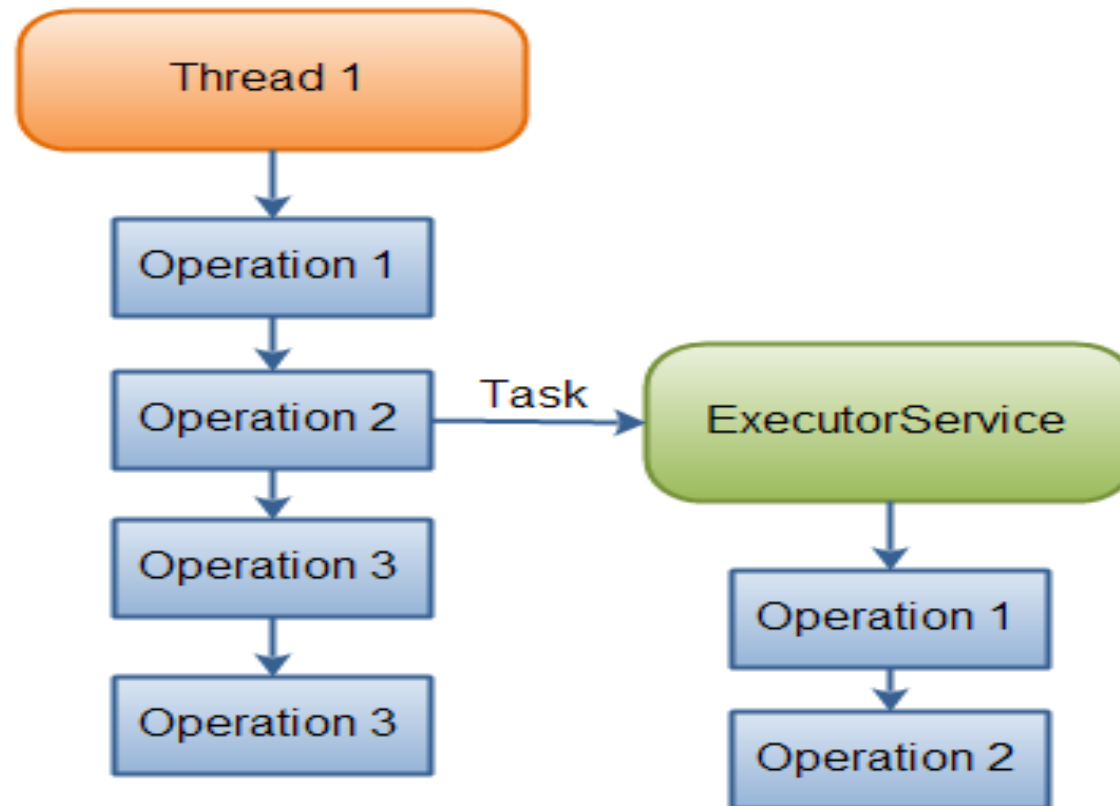
Effectively Immutability.

Figuring Single Thread Confinement.

Composition.



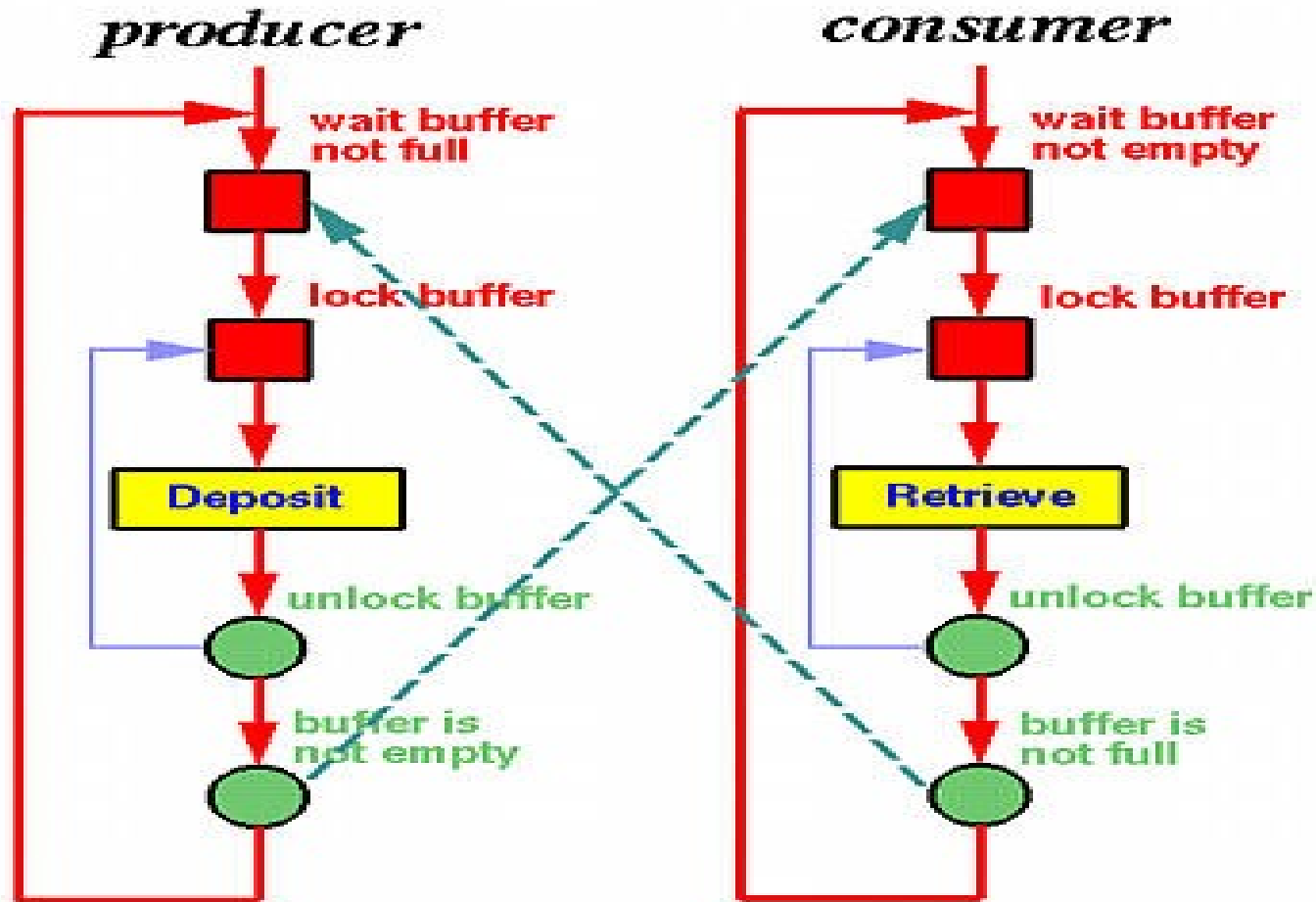
Testing Asynchronous Method Calls



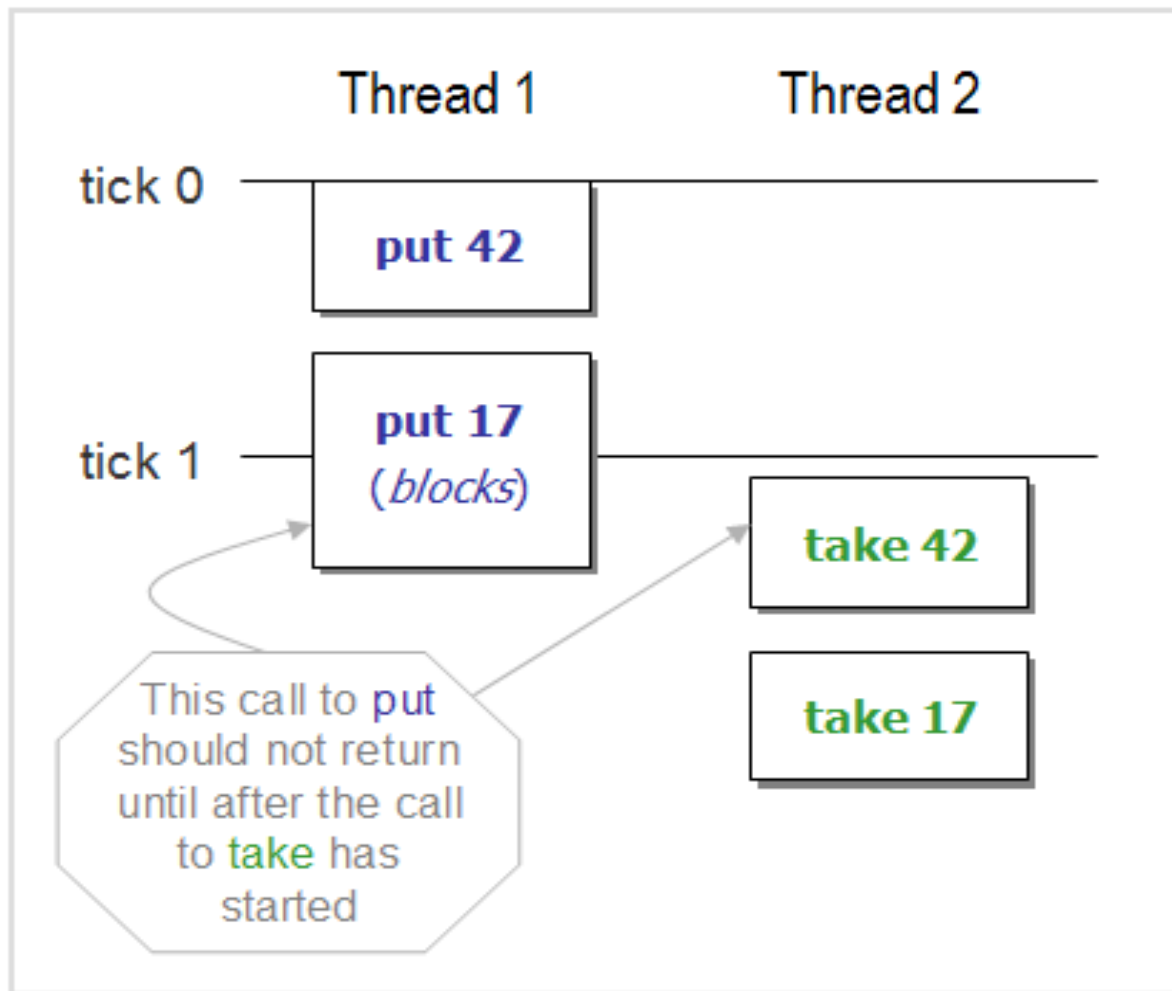
Asynchronous Job Signal Demo



Testing for Resource Management



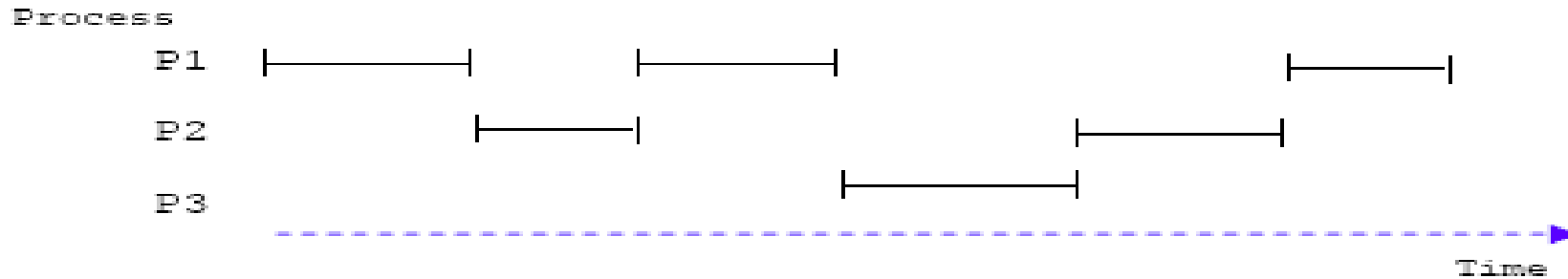
Bounded Job Queue



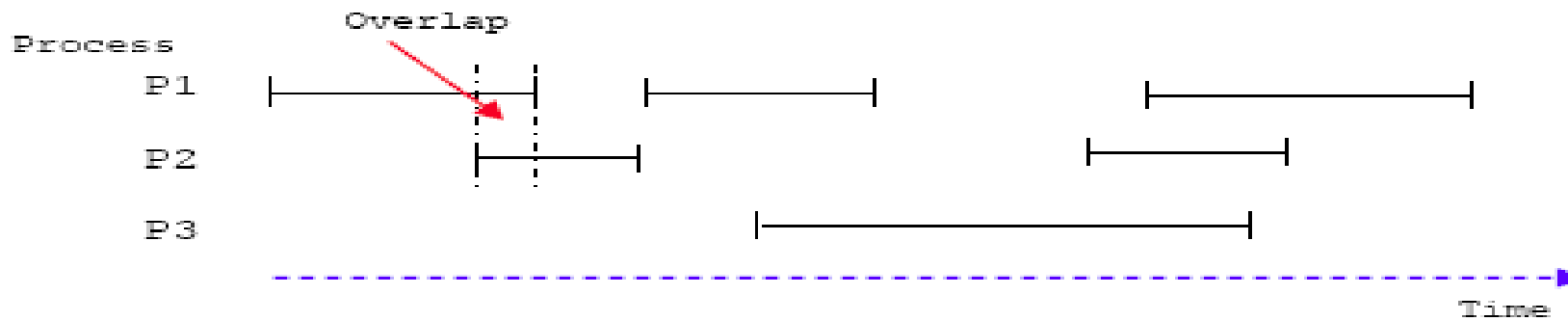
Test for Blocking Operations - Demo



Testing for Thread Safety



(a) Interleaving



(b) Interleaving and overlapping

Bounded Job Queue Thread Interleaving Test



Complementary Testing Approaches

- Injecting Callbacks.
- Static code Analysis Tools.
- Code Review.
- Profilers and Monitoring tools.
- Frameworks for Multi-threaded Testing.
 - ConcJunit
 - Awaitility
 - MultiThreadedTC



Questions

Questions/Comments/Feedback



Thank you

