# Principles of Java Multithreaded Programming

## **Table Of Contents**

#### Overview

- Why Java
- Parallelism vs. Asynchronous
- Process vs. Thread
- Quick note about Java 8 Lambda Expressions

#### **Java Threads**

- Runnable Interface
  - Example
- Sleep, Interrupts, Join
  - Sleep
  - Interrupts
  - Example
  - Creating Interrupts
  - Join
  - Example
- Thread Pools
  - What Do Thread Pools Do?
  - The Optimal Thread Pool Size
  - Little's Law
- Executor Interface
  - Types of Executors
  - Fixed Thread Pool
  - Fork/Join Pool

# **Java Memory Models**

- Thread Sate
- Shared Vs. Local Variables
- Java Object Models
- One Thread / One Object
  - Example
- Multiple Threads / One Object
  - Example
- Locks and Atomic Variables in Java
- Synchronized
- Synchronized Methods

- Example
- Memory Model
- Synchronized Statements
  - Example
- Memory Model
- Example
- Dangers of Improper Locking
- Final Note about Synchronized
- Volatile
- Volatile Cons
  - Example
- Volatile Performance v. Synchronized Performance
  - The Cost of a Volatile Cache flush

### **Atomic Operations**

- Atomic Primatives
- Atomic Class Methods
- LongAdder, LongAccumulator

#### Futures (Java 8)

- Futures Continued
- Batching Futures

#### **Concurrent Collections**

- Common Concurrent Collections
- Java Strings
- Different String Alternatives
- String Alternatives Comparison

#### Resources

- References
- Thank You

-----

# **Excluded**

Implementation Details of the Java Compiler

- Ordering of Events
- Happens Before
- Expectations
- Compiler Transformations (Practical Example)
  - Example
  - Transformed Example
- How Volatile can help

### **Immutability**

- Final Fields
- Final Field Compiler Optimizations
- Final Field Intialization
  - Example

# Software Design Patterns, Tips, and Tricks

- Thread Save Lazy Loading
- Properties that Must hold True for a Multi-Threaded Singleton
- Double Check Locking
  - Example
  - Example
  - Example
- Multi-threaded lazy loading with Java Language Tricks