

# Java Concurrency Lab Manual

## Lab #2 – Building the Entity classes

### Entity Class Overview

#### SensorData

We need a class to hold the data from a specific sensor. This entity class will be an **Immutable** class. The data fields we need are:

- A sensor type → an Enum containing: Temperature, Pressure, or Volume
- A Timestamp → a java.time.Instant (not allowed to be null)
- A data value → a double
- A sensor Id → a String (not allowed to be null or empty)

#### SensorSummary

We need a class to hold the Sensor Summary data sent from the SensorController to the MasterSensorManger, this will be a **MultiThreaded** class.

The Data fields we need are:

- The number of Sensors → an AtomicInteger (cannot be negative)
- A collection of SensorData objects → a java.util.concurrent.ConcurrentLinkedQueue
- A Timestamp → a java.time.Instant (not allowed to be null)

#### An Immutable Class

An immutable class has the following characteristics:

- All fields should be private and final
- There should be no setter methods
- The class should be declared final
- Any non-primitive field should not have a getter that exposes the reference
- All referenced object should not have any visible changes

#### A MultiThreaded Class

A multi-threaded class has the following characteristics:

- Local variables are preferred

- All variables are mark final if possible
- Non final class scope variables are locked prior to use via:
  - Synchronization
  - Explicit Locks
  - Using a Concurrent Collection instance

## Lab Assignment

You are to create two new classes within the sensor-data project: SensorData and SensorSummary. You are required to:

- Log everything via Log4J (there is a log4j.xml config file in the src/test/resources folder of this project)
- Add JavaDocs for the class and all public fields/methods, including using the custom JavaDoc annotations where appropriate
- Create JUnit tests for all methods, run these via the Maven test command
- Run Code Review for the sensor-data project
- Test using VMLens for any class that may have a Data Race or Deadlock condition