The LockManager App Case Study: Overview

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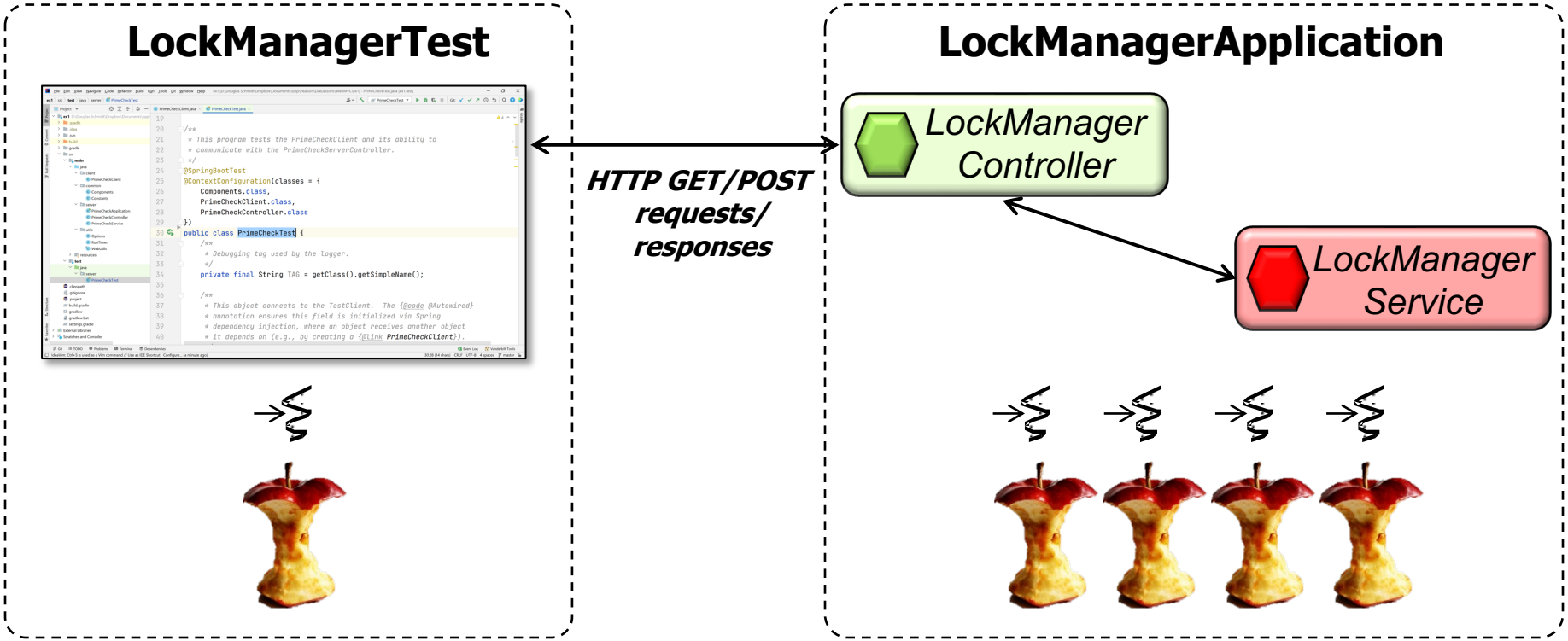
Learning Objectives in this Part of the Lesson

- Understand how Spring WebFlux sends/receives HTTP GET & POST requests asynchronously to/from a microservice that provides a distributed semaphore



See github.com/douglascraigschmidt/LiveLessons/tree/master/WebFlux/ex1

Overview of the Lock Manager App Case Study

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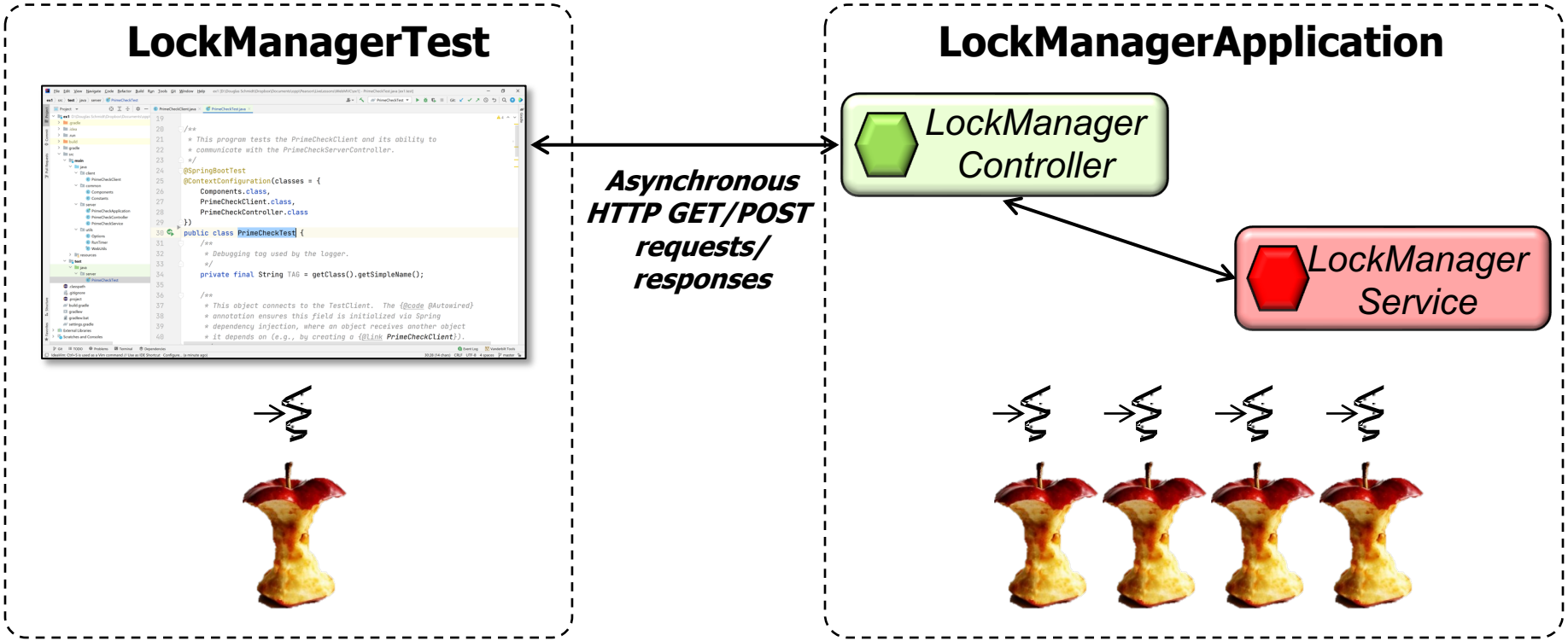
- This case study shows how Spring WebFlux sends & receives HTTP GET/POST requests asynchronously to/from a LockManager microservice



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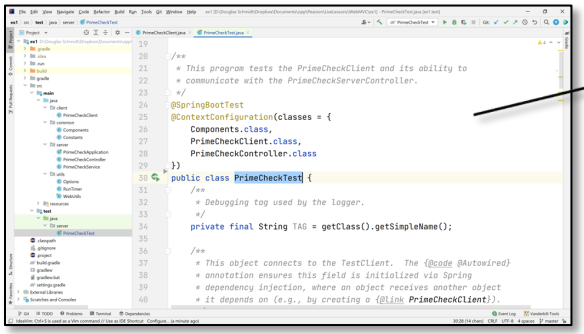
LockManagerTest



```
/**
 * This program tests the PrimeCheckClient and its ability to
 * communicate with the PrimeCheckServerController.
 */
@SpringBootTest
@ContextConfiguration(classes = {
    Components.class,
    PrimeCheckClient.class,
    PrimeCheckController.class
})
public class PrimeCheckTest {
    /**
     * Debugging tag used by the logger.
     */
    private final String TAG = getClass().getSimpleName();

    /**
     * This object connects to the TestClient.  The {@code @Autowired}
     * annotation ensures this field is initialized via Spring
     * dependency injection, where an object receives another object
     * it depends on (e.g., by creating a {@link PrimeCheckClient}).
```

The client can asynchronously acquire & release locks individually or in bulk via the declarative LockAPI interface

LockAPI

acquire(Integer)	Flux<Lock>
create(Integer)	Mono<Boolean>
release(Lock)	Mono<Boolean>
release(List<Lock>)	Mono<Boolean>
acquire()	Mono<Lock>

See WebFlux/ex1/src/test/java/edu/vandy/lockmanager/LockManagerTests.java

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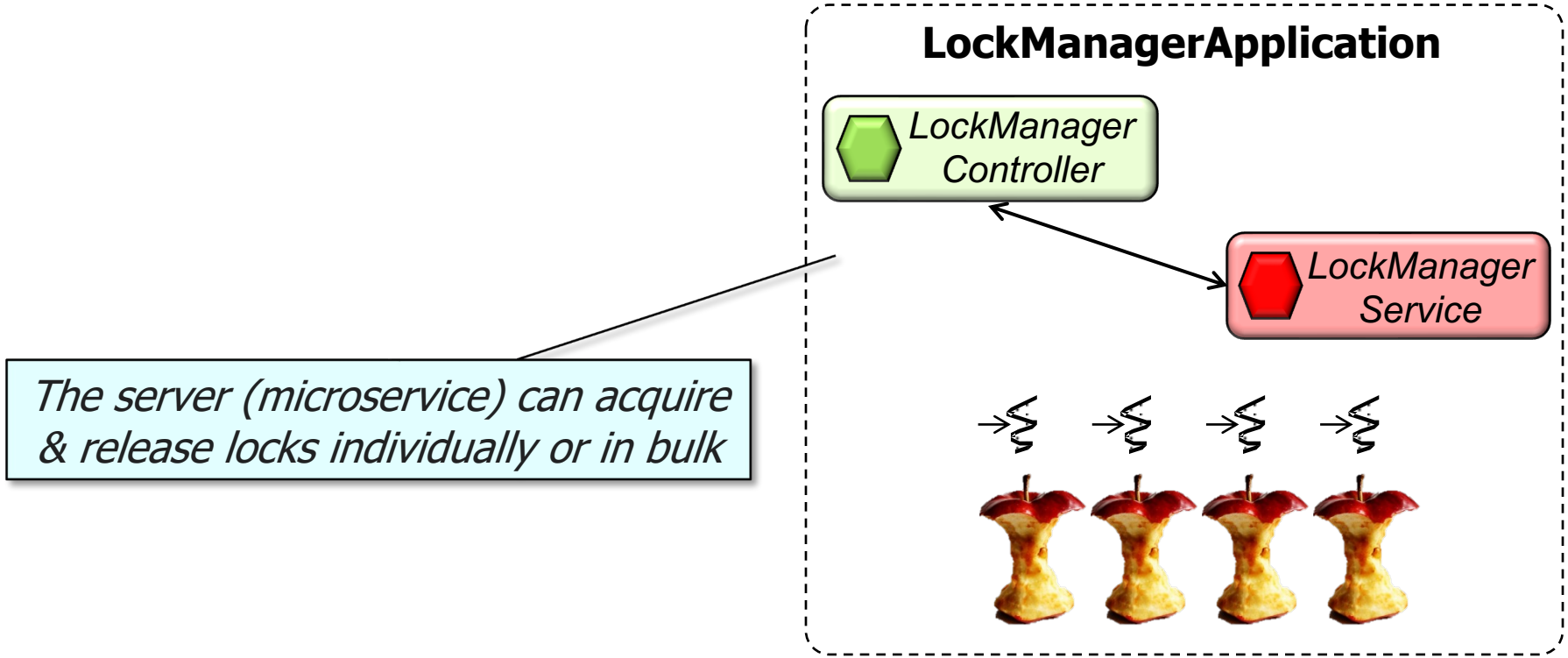

See WebFlux/ex1/src/main/java/edu/vandy/lockmanager/server

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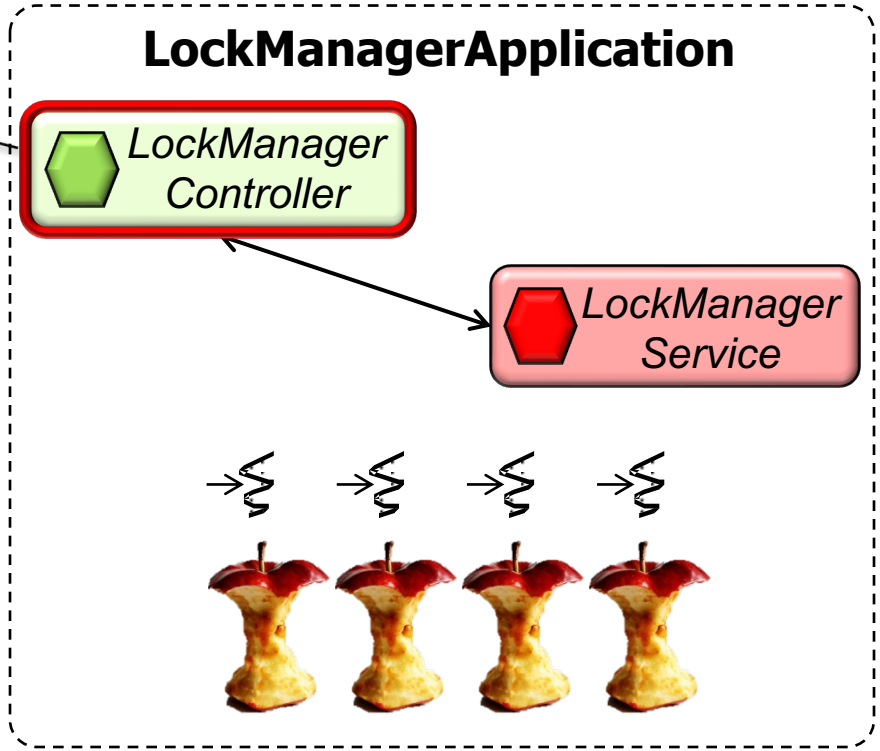
LockManagerController converts HTTP GET/POST requests into Java types & forwards them to LockManagerService

LockManagerController	
mService	LockManagerService
acquire(Integer)	Flux<Lock>
release(List<Lock>)	Mono<Boolean>
isAlive()	String
create(Integer)	Mono<Boolean>
acquire()	Mono<Lock>
release(Lock)	Mono<Boolean>



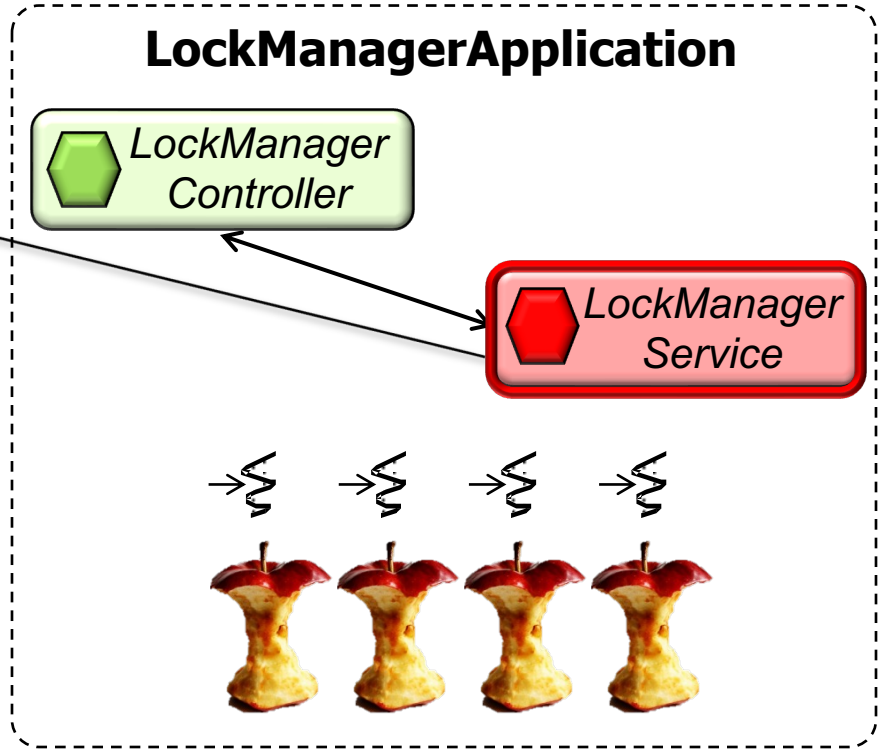
See WebFlux/ex1/src/main/java/edu/vandy/lockmanager/server/LockManagerController.java

Overview of the LockManager App Case Study

- This case study shows how Spring WebFlux sends & receives HTTP GET/POST requests asynchronously to/from a LockManager microservice

LockManagerService uses an ArrayBlockingQueue, reactive programming, & virtual threads to implement a distributed semaphore

LockManagerService	
mAvailableLocks	ArrayBlockingQueue<Lock>
release(Lock)	Mono<Boolean>
create(Integer)	Mono<Boolean>
acquire()	Mono<Lock>
acquire(int)	Flux<Lock>
makeLocks(int)	List<Lock>
release(List<Lock>)	Mono<Boolean>
tryAcquireLock(List<Lock>)	Integer



See WebFlux/ex1/src/main/java/edu/vandy/lockmanager/server/LockManagerService.java

Structure of the Lock Manager App Project

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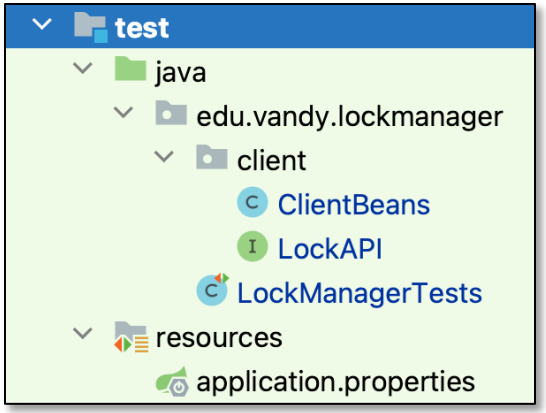
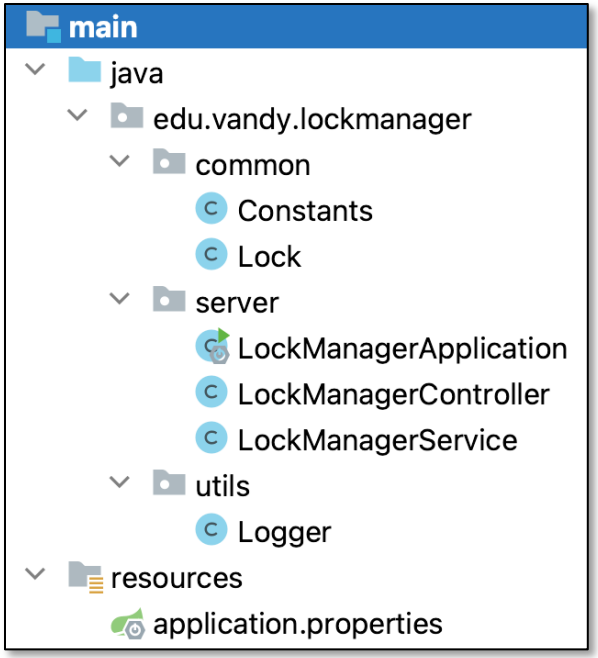
- The LockManager App project source code is organized into several packages





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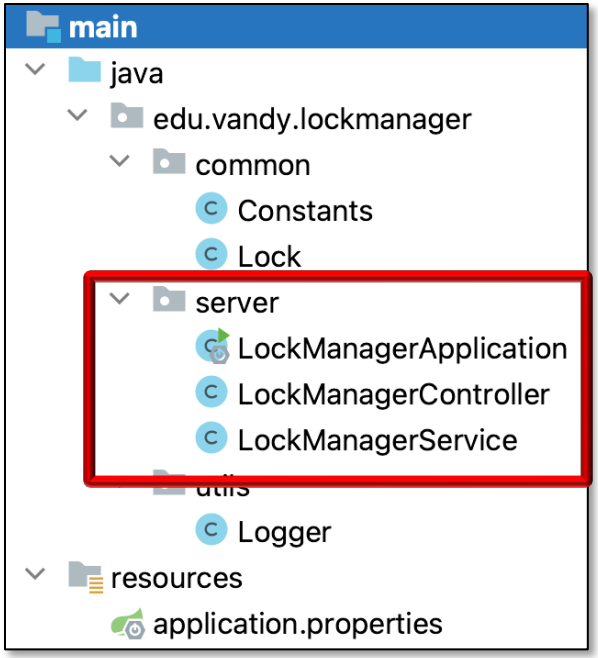
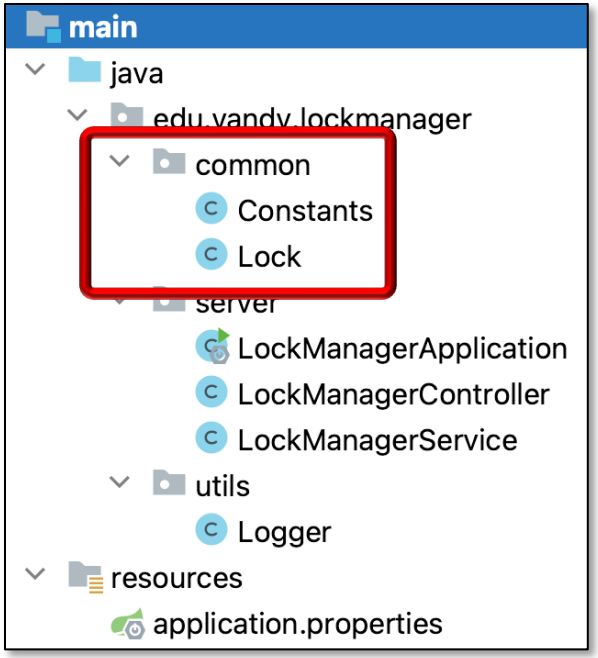
Structure of the LockManager App Project

- The LockManager App project source code is organized into several packages
  - main
    - server
      - Contains the "app" entry point, the controller, & the service
        - This implementation uses reactive programming & reactive types



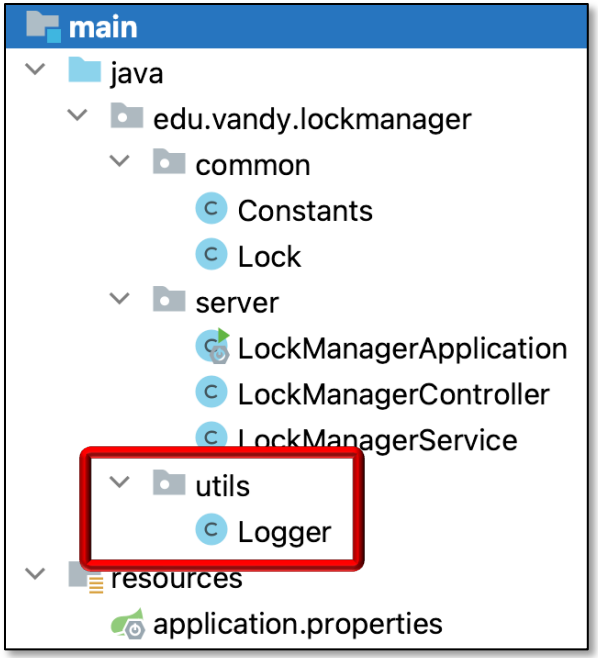
Structure of the LockManager App Project

- The LockManager App project source code is organized into several packages
  - main
    - server
    - common
      - Consolidates various project-specific helper classes, including the Lock object



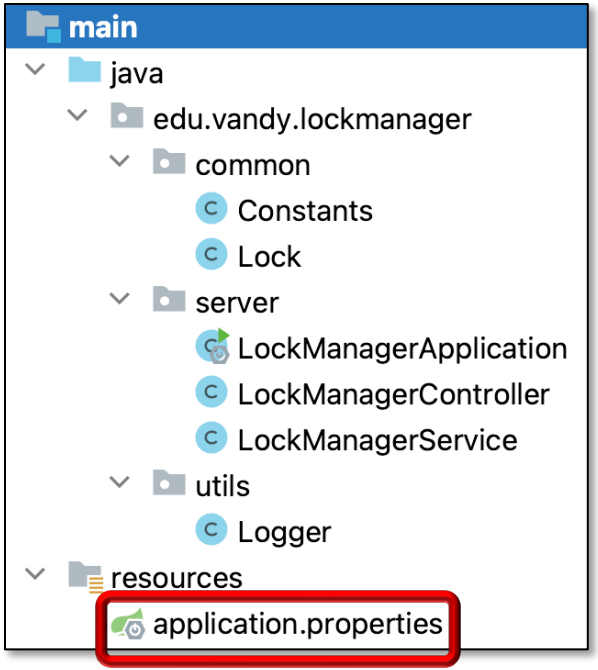
Structure of the LockManager App Project

- The LockManager App project source code is organized into several packages
  - main
    - server
    - common
    - utils
      - General-purpose utilities



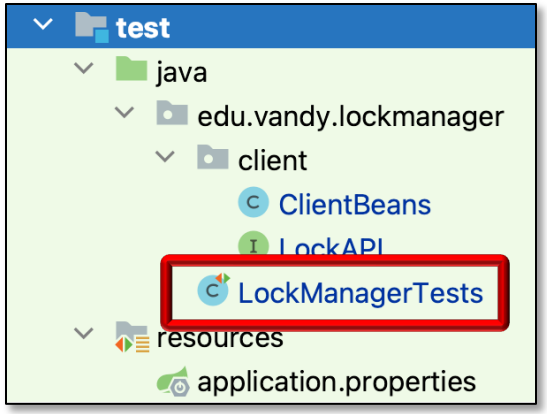
Structure of the LockManager App Project

- The LockManager App project source code is organized into several packages
  - main
    - server
    - common
    - utils
    - resources
      - Defines various application properties
        - e.g., name & port number



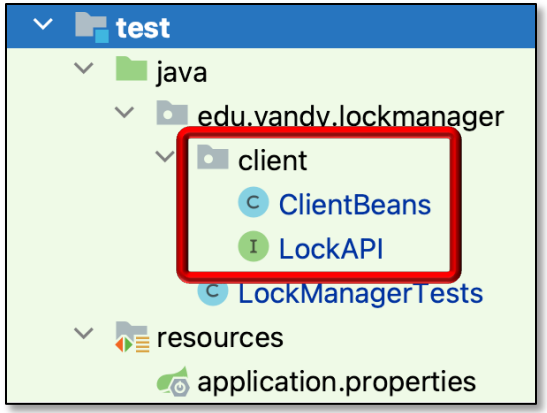
Structure of the LockManager App Project

- The LockManager App project source code is organized into several packages
  - test
    - LockManagerTest
      - This test driver initiates calls to the LockManager microservice



Structure of the LockManager App Project

- The LockManager App project source code is organized into several packages
  - test
    - LockManagerTest
    - client
      - Sends/receives HTTP GET/POST requests to the LockManager microservice asynchronously
        - Uses the declarative HTTP interface features in Spring 6



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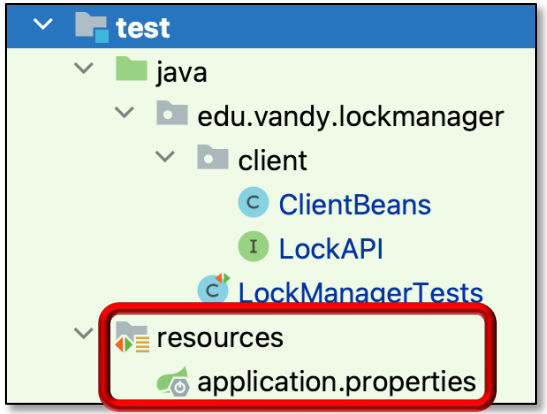
- The LockManager App project source code is organized into several packages
  - test
    - LockManagerTest
    - client
    - resources
      - Enables/disables Spring logging



Pros & Cons of the LockManager App

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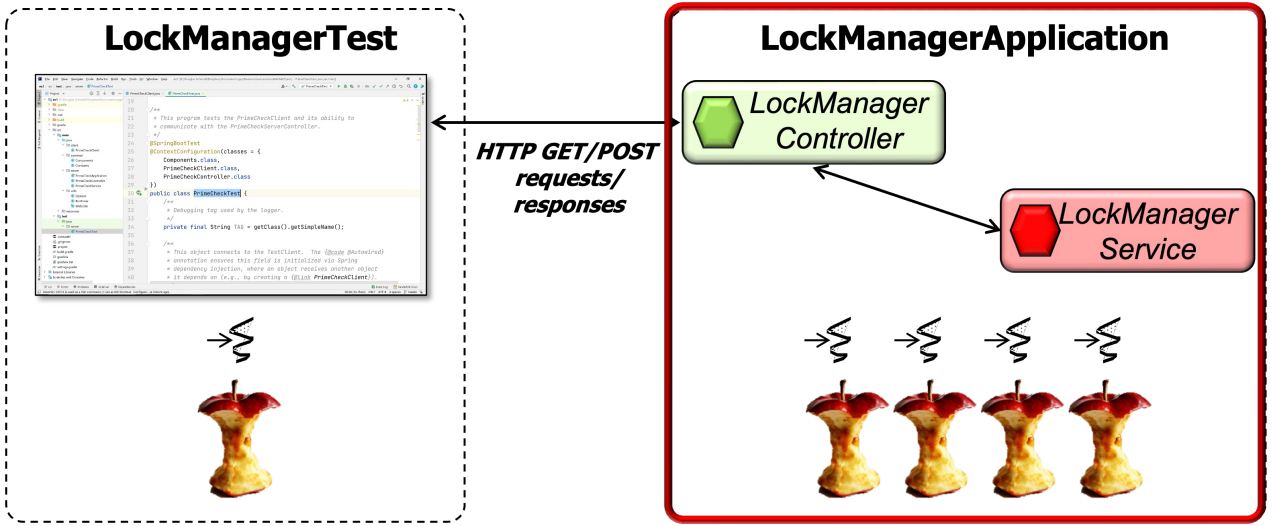
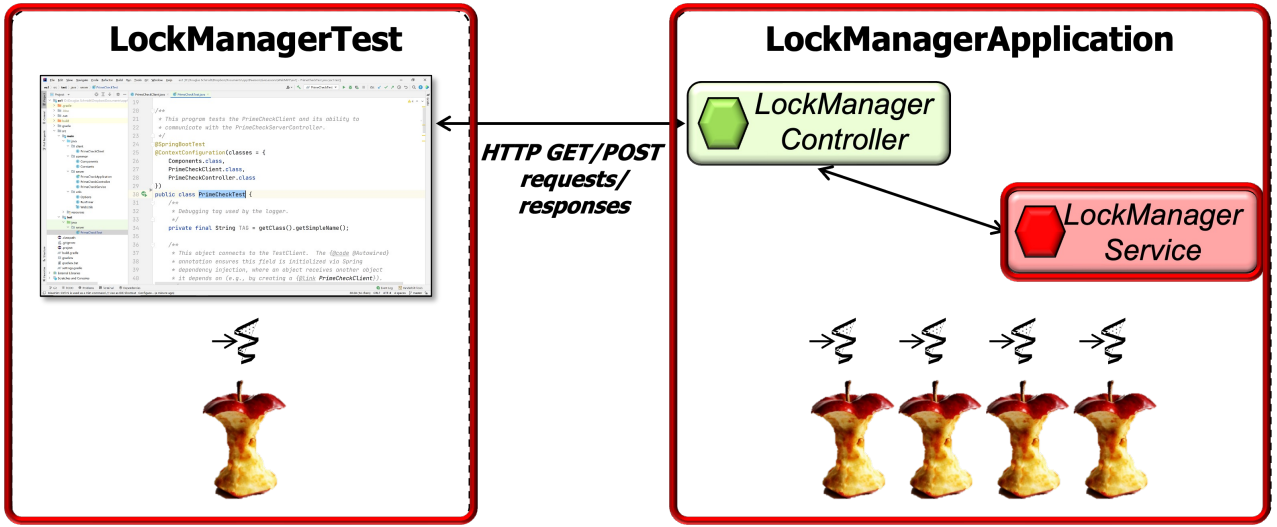
- Pros
  - Virtual threads are used on the server to improve scalability



In contrast, the Spring WebVMC LockManager app used the servlet thread pool

Pros & Cons of the LockManager App

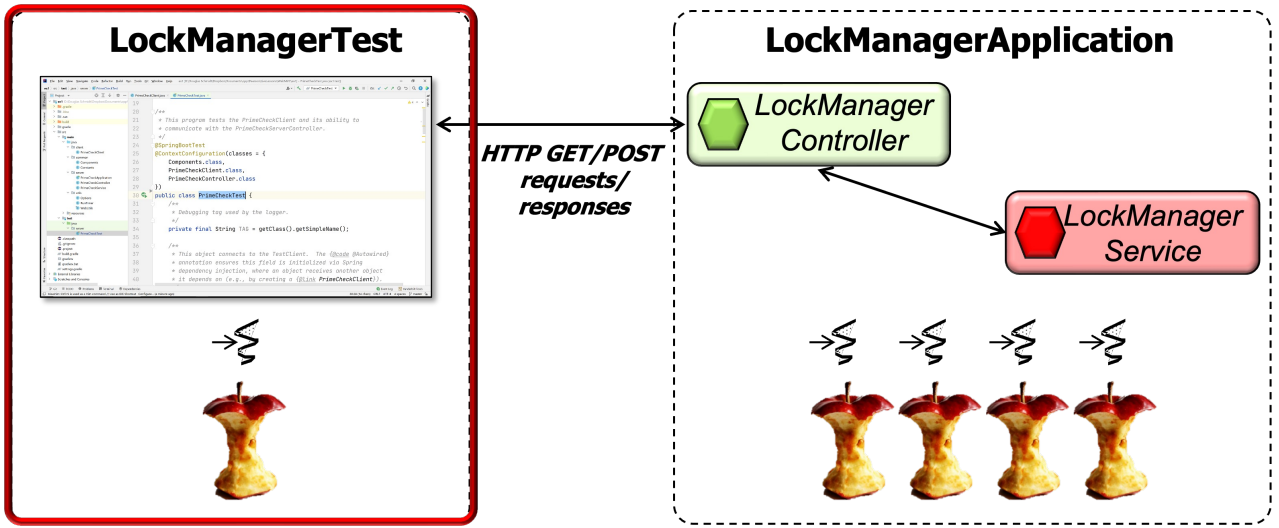
- Pros
  - Virtual threads are used on the server to improve scalability
  - The client (& server) are fully reactive & async



In contrast, the Spring WebVMC LockManager app wasn't fully reactive & async

Pros & Cons of the LockManager App

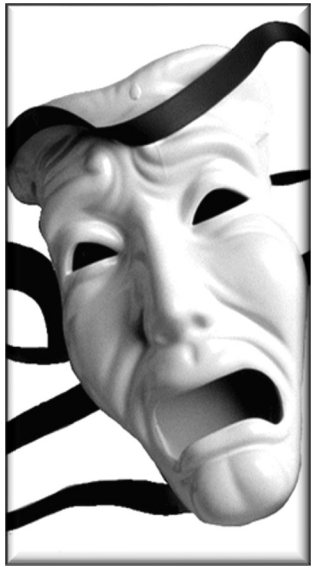
- Pros
  - Virtual threads are used on the server to improve scalability
  - The client (& server) are fully reactive & async
  - The client uses declarative Spring 6 HTTP interface asynchronous proxies

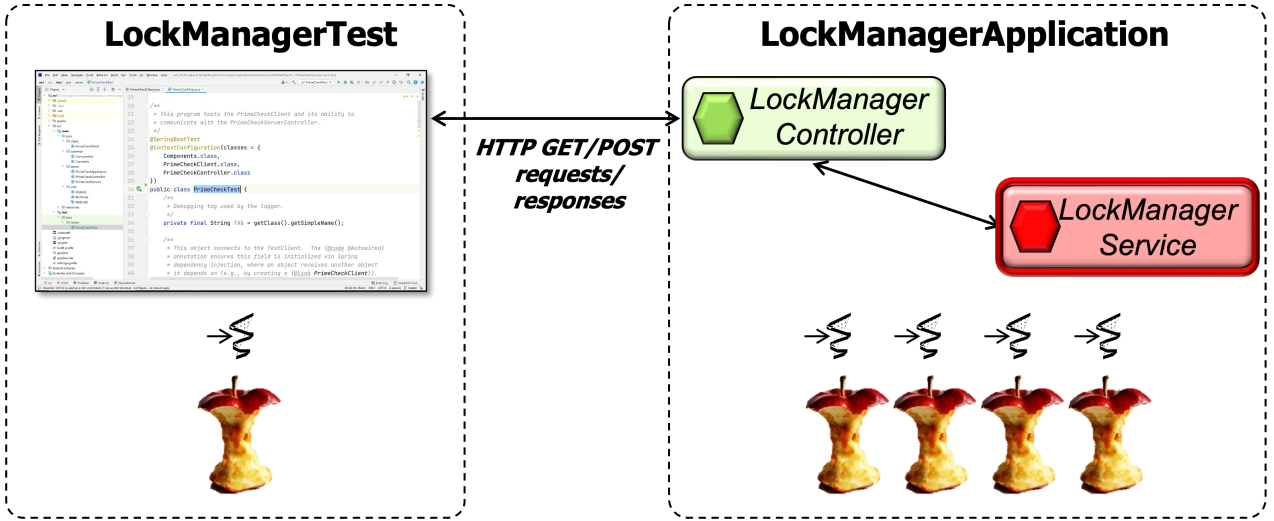


See www.baeldung.com/spring-6-http-interface

Pros & Cons of the LockManager App

- Cons
  - While the ArrayBlockingQueue implementation is clever, it's not optimal





There are far more optimal ways of implementing a semaphore!!

End of the LockManager App Case Study: Overview