The PrimeCheck App Case Study: Server Structure & Functionality

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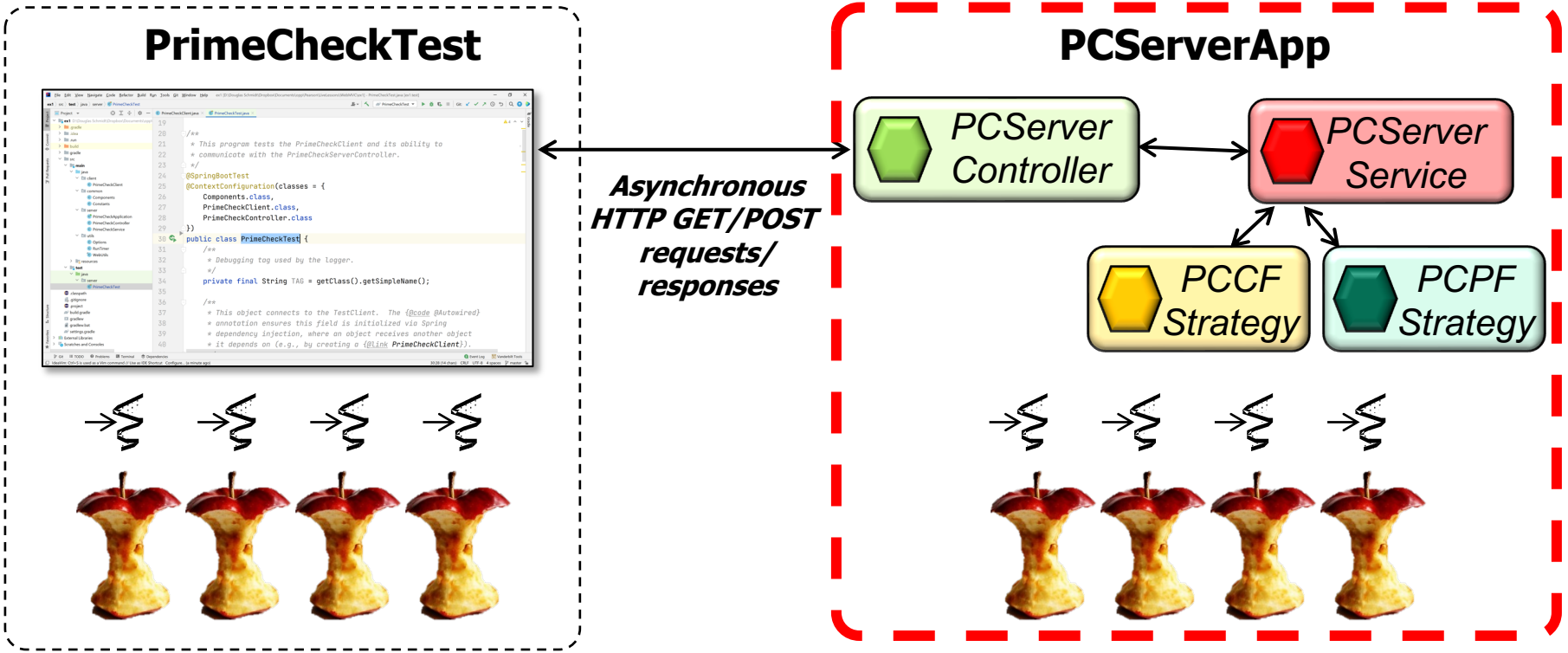
Learning Objectives in this Part of the Lesson

- Understand the structure & functionality of the PCServerController & the PC ServerService & how they check the primality of large integers asynchronously



See github.com/douglascraigschmidt/LiveLessons/tree/master/WebFlux/ex2

Structure & Functionality of the PCServerController

Structure & Functionality of the PCServerController

- Client HTTP GET/POST requests are mapped to endpoint handlers via the PCServerController class

```
@RestController
public class PCServerController {
  @GetMapping(CHECK_IF_PRIME)
  public Integer checkIfPrime
    (Integer strategy,
     Integer primeCandidate) {...}

  @PostMapping(value = CHECK_IF_PRIME_FLUX,
       consumes = APPLICATION_NDJSON_VALUE)
  public Flux<Integer>
  checkIfPrimeFlux
    (Integer Strategy,
     @RequestBody Flux<Integer>
       primeCandidates) {...}
}
```

See WebFlux/ex2/src/main/java/server/PCServerController.java

Structure & Functionality of the PCServerController

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This annotation ensures request handlers in the controller automatically serialize return objects into HttpResponse objects

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}
```

See www.baeldung.com/spring-controller-vs-restcontroller

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}
```

These methods forward to PCServerService methods, which then forward to the designated strategy to determine the primality of params & return results

Structure & Functionality of the PCServerController

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These annotations map HTTP GET/POST requests onto endpoint handlers

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See www.baeldung.com/spring-new-requestmapping-shortcuts

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       primeCandidates) {...}
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```

These strings identify the endpoint handlers from HTTP GET/POST requests

See www.baeldung.com/spring-new-requestmapping-shortcuts

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- Client HTTP GET/POST requests are mapped to endpoint handlers via the PCServerController class

Enables passing Flux as a param!

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  checkIfPrimeFlux
    (Integer Strategy,
     @RequestBody Flux<Integer>
       primeCandidates) {...}
}
```

```
{"value": 23}
{"value": 371}
{"value": 59}
{"value": 7893}
```

See nurkiewicz.com/2021/08/json-streaming-in-webflux.html

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     @RequestBody Flux<Integer>
       primeCandidates) {...}
}
```

This annotation maps the HttpRequest object into a Java object

See www.baeldung.com/spring-request-response-body

Structure & Functionality of the PCServerService

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
   ...
}
```

See WebFlux/ex2/src/main/java/server/PCServerService.java

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
   ...
}
```

This annotation indicates the class implements "business logic" & enables auto-detection & wiring of dependent classes via classpath scanning

See www.baeldung.com/spring-component-repository-service

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
  PCAbstractStrategy[] mStrategy = {
    new PCConcurrentFluxStrategy(),
    new PCParallelFluxStrategy()
  };

  ...
}
```

This array contains concrete strategies whose methods are implemented to check for primality

This solution could also be implemented via multiple microservices

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
   ...
   public Integer checkIfPrime
      (Integer strategy,
       Integer primeCandidate) {
     mStrategy[strategy]
       .checkIfPrime(primeCandidate);
   }

   ...
}
```

Checks the primality of a single Integer

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
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   public Integer checkIfPrime
      (Integer strategy,
       Integer primeCandidate) {
      mStrategy[strategy]
        .checkIfPrime(primeCandidate);
   }

   ...
}
```

Which implementation strategy to forward the request to

Structure & Functionality of the PCServerService

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```
@Service
public class PCServerService
   ...
   public Integer checkIfPrime
      (Integer strategy,
       Integer primeCandidate) {
     mStrategy[strategy]
        .checkIfPrime(primeCandidate);
   }

   ...
}
```

Checks the primeCandidate param for primality & returns 0 if it's prime or the smallest factor if it's not

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

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@Service
public class PCServerService
   ...
   public Integer checkIfPrime
      (Integer strategy,
       Integer primeCandidate) {
      mStrategy[strategy]
        .checkIfPrime(primeCandidate);
   }

   ...
}
```

Forward to the given strategy

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
   ...
   public Flux<Integer>
   checkIfPrimeFlux
      (Integer strategy,
       Flux<Integer> primeCandidates) {
       mStrategy[strategy]
         .checkIfPrimeFlux(primeCandidates);
   }
}
```

Check all the elements in a Flux for primality

Structure & Functionality of the PCServerService

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public class PCServerService
  ...
  public Flux<Integer>
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    (Integer strategy,
     Flux<Integer> primeCandidates) {
     mStrategy[strategy]
      .checkIfPrimeFlux(primeCandidates);
  }
}
```

Which implementation strategy to forward the request to

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
  ...
  public Flux<Integer>
  checkIfPrimeFlux
    (Integer strategy,
     Flux<Integer> primeCandidates) {
     mStrategy[strategy]
       .checkIfPrimeFlux(primeCandidates);
  }
}
```

Check all elements in the primeCandidates Flux param for primality & return a Flux whose results are 0 if an element is prime or the smallest factor if it's not

Structure & Functionality of the PCServerService

- The PCServerService class defines implementation methods that are called by the PCServerController

```
@Service
public class PCServerService
  ...
  public Flux<Integer>
  checkIfPrimeFlux
    (Integer strategy,
     Flux<Integer> primeCandidates) {
     mStrategy[strategy]
       .checkIfPrimeFlux(primeCandidates);
  }
}
```

Forward to the given strategy

Structure & Functionality of the PCServerService

- PCAbstractStrategy defines a default method & an abstract method called by PCServerService

```
public interface PCAbstractStrategy {
  default Integer checkIfPrime
          (Integer primeCandidate) {
    return isPrime(primeCandidate);
  }

  Flux<Integer> checkIfPrimeFlux
          (Flux<Integer> primeCandidates);
}
```

Structure & Functionality of the PCServerService

- PCAbstractStrategy defines a default method & an abstract method called by PCServerService

```
public interface PCAbstractStrategy {
  default Integer checkIfPrime
                  (Integer primeCandidate) {
    return isPrime(primeCandidate);
  }

  Flux<Integer> checkIfPrimeFlux
                  (Flux<Integer> primeCandidates);
}
```

This default method can be used for all the strategies since it's very straightforward

See docs.oracle.com/javase/tutorial/java/IandI/defaultmethods.html

Structure & Functionality of the PCServerService

- PCAbstractStrategy defines a default method & an abstract method called by PCServerService

```
public interface PCAbstractStrategy {
  default Integer checkIfPrime
          (Integer primeCandidate) {
    return isPrime(primeCandidate);
  }

  Flux<Integer> checkIfPrimeFlux
          (Flux<Integer> primeCandidates);
}
```

This 'abstract' method must be defined by an implementation class

e.g., PCParallelFluxStrategy, PCConcurrentFluxStrategy, etc.

End of the PrimeCheck App Case Study: Server Structure & Functionality