Overview of Spring WebMVC

Douglas C. Schmidt
d.schmidt@vanderbilt.edu
www.dre.vanderbilt.edu/~schmidt

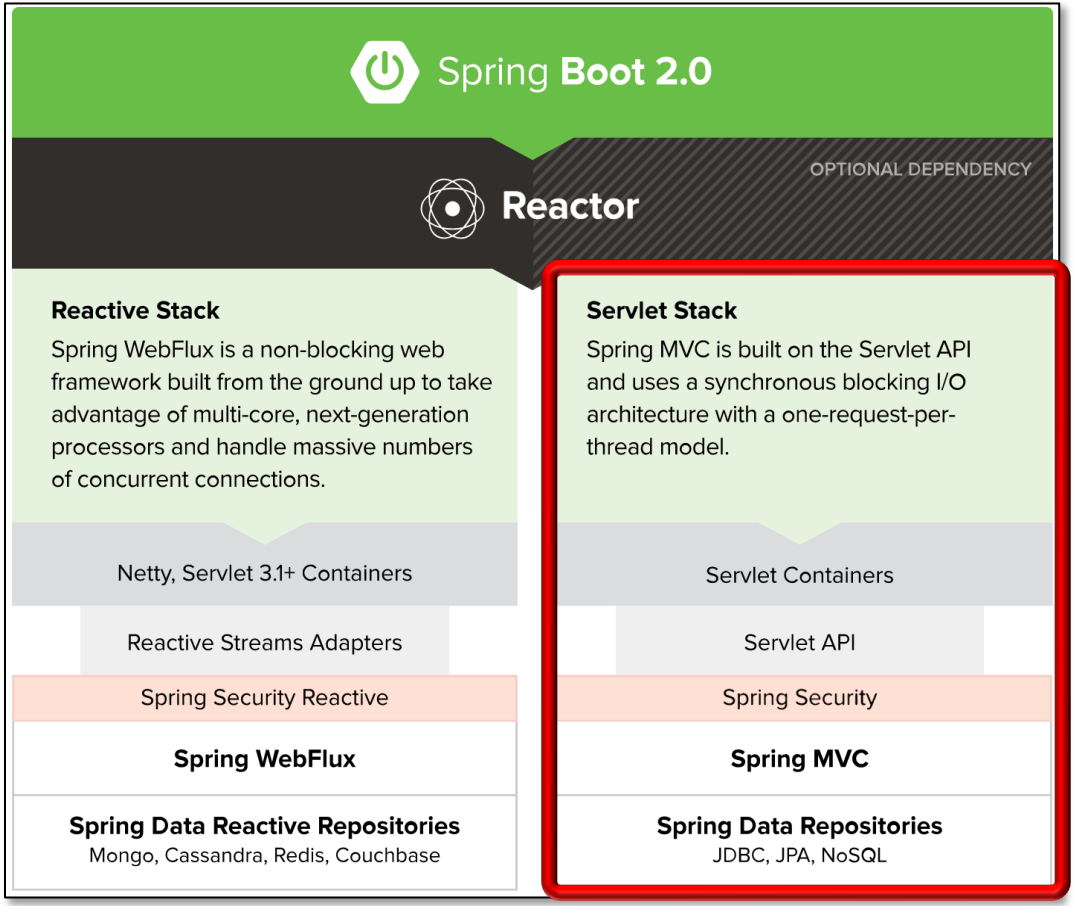
Professor of Computer Science

Institute for Software
Integrated Systems

Vanderbilt University
Nashville, Tennessee, USA

Learning Objectives in this Lesson

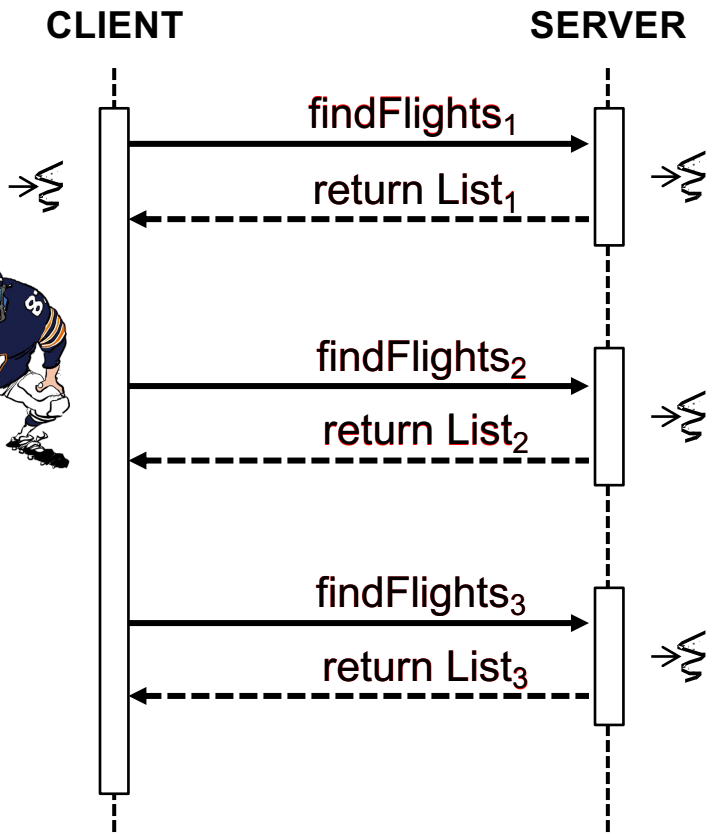
- Understand the structure & functionality of the Spring WebMVC framework supported by Spring Boot 2.0



See docs.spring.io/spring-framework/docs/3.2.x/spring-framework-reference/html/mvc.html

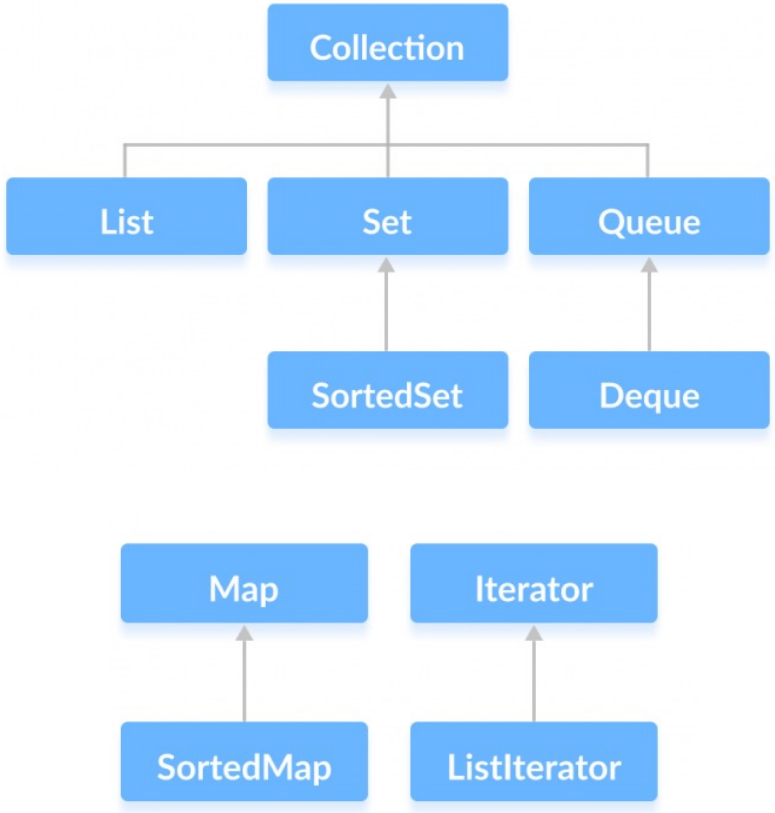
Learning Objectives in this Lesson

- Understand the structure & functionality of the Spring WebMVC framework supported by Spring Boot 2.0, e.g.
  - Its concurrency model



Learning Objectives in this Lesson

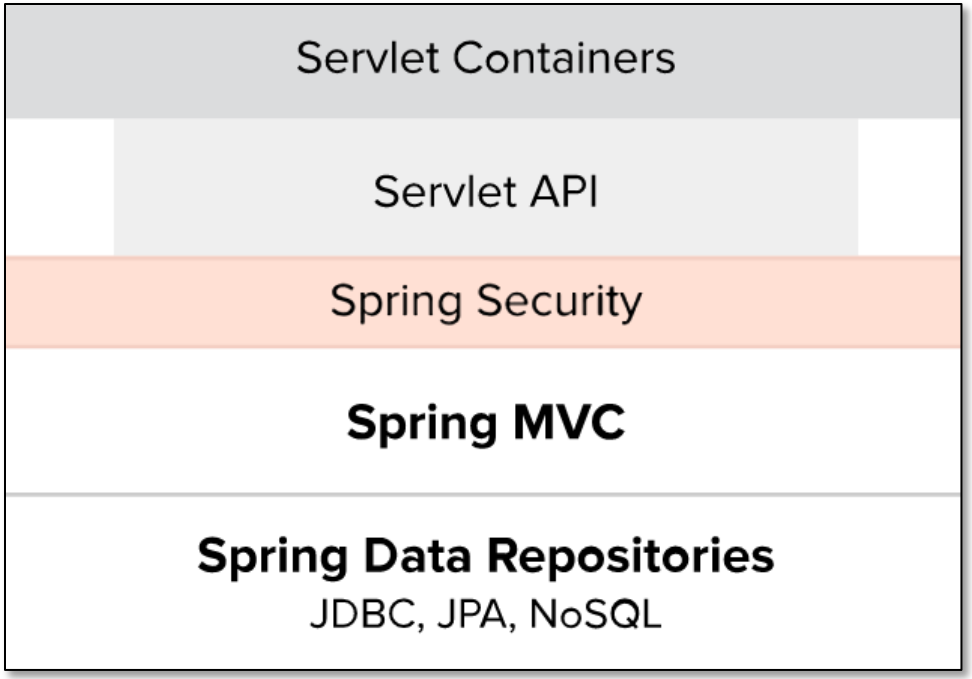
- Understand the structure & functionality of the Spring WebMVC framework supported by Spring Boot 2.0, e.g.
  - Its concurrency model
  - Its communication model



Overview of Spring WebMVC Concurrency

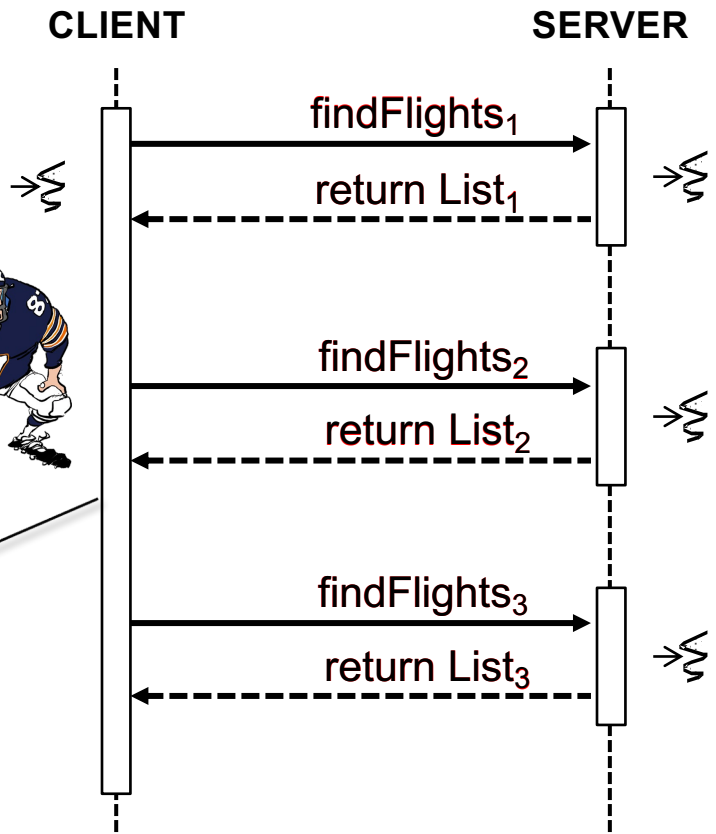
Overview of Spring WebMVC Concurrency

- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model



Overview of Spring WebMVC Concurrency

- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model
    - Each request is handled by a thread that blocks until it is able to fully process the request

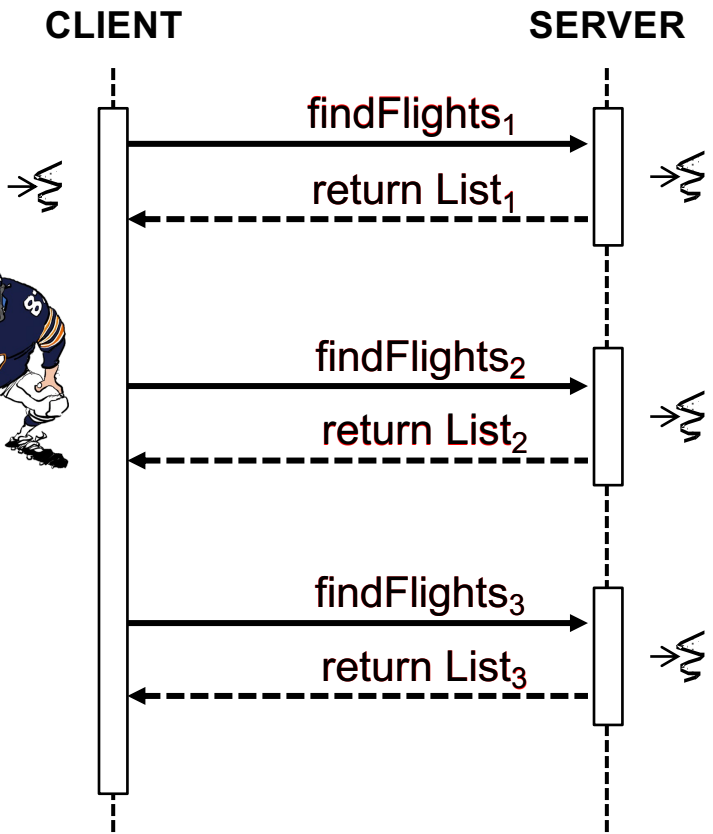


A request to a list of flights from a database over the network might take a few seconds, which blocks threads from servicing other requests & responses

See en.wikipedia.org/wiki/Blocking_(computing)

Overview of Spring WebMVC Concurrency

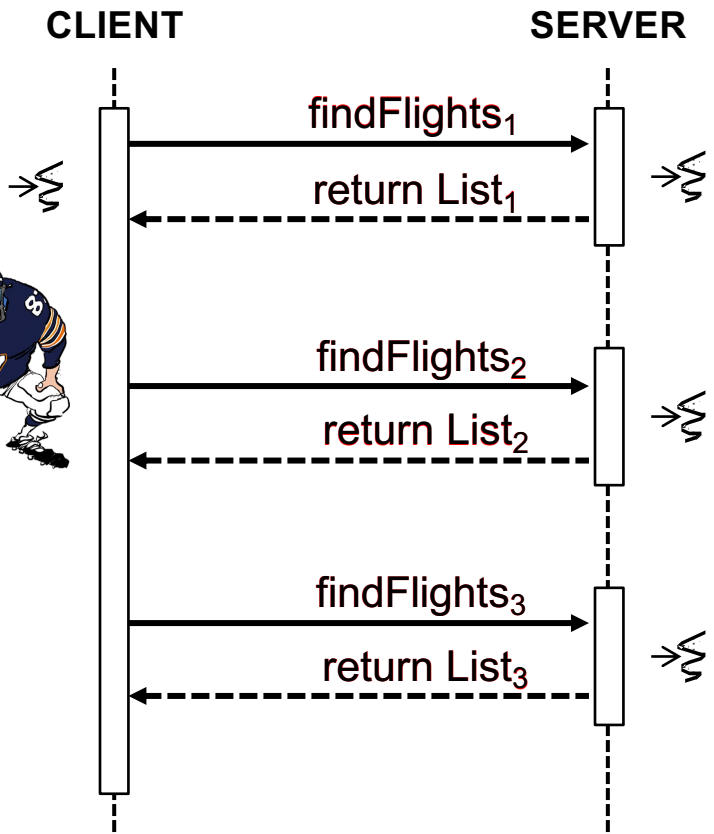
- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model
    - Each request is handled by a thread that blocks until it is able to fully process the request
      - Blocking calls are a natural form of back pressure



See medium.com/@jayphelps/backpressure-explained-the-flow-of-data-through-software-2350b3e77ce7

Overview of Spring WebMVC Concurrency

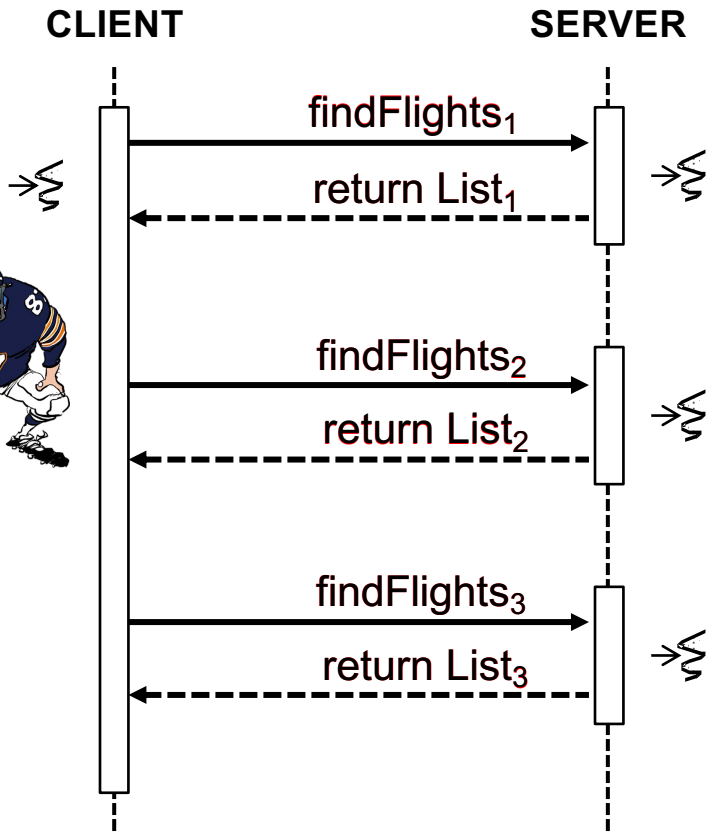
- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model
    - Each request is handled by a thread that blocks until it is able to fully process the request
      - Blocking calls are a natural form of back pressure
        - Forces the caller to wait



See en.wikipedia.org/wiki/Rate_limiting

Overview of Spring WebMVC Concurrency

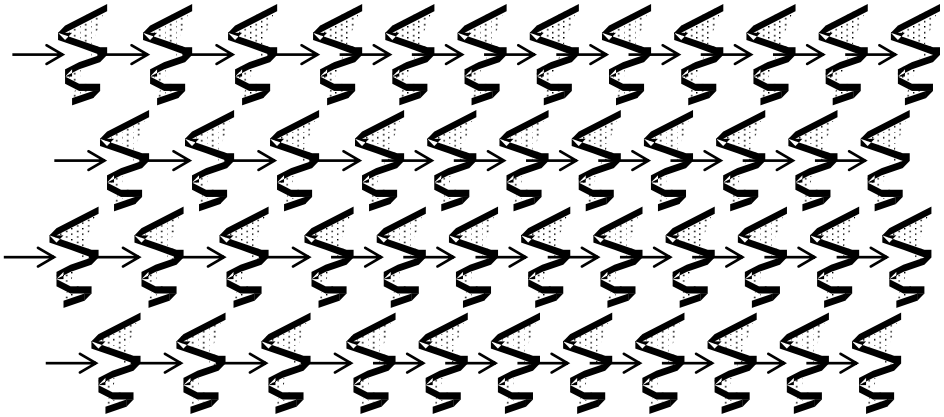
- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model
    - Each request is handled by a thread that blocks until it is able to fully process the request
      - Blocking calls are a natural form of back pressure
        - Forces the caller to wait
        - Eliminates the need for end-to-end rate control

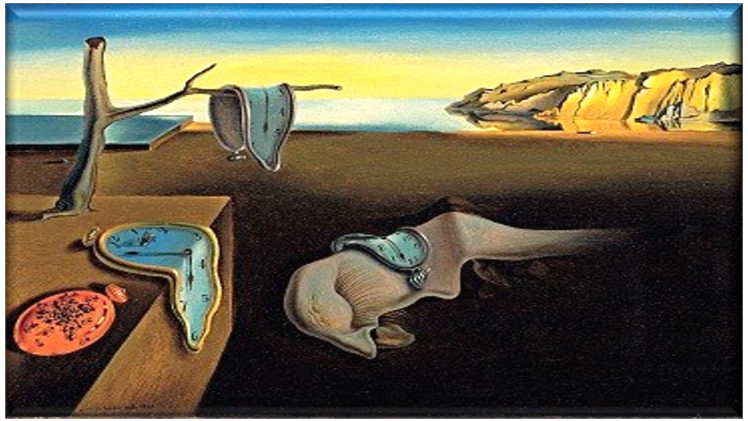


See en.wikipedia.org/wiki/Rate_limiting

Overview of Spring WebMVC Communication

- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model
    - Each request is handled by a thread that blocks until it is able to fully process the request
      - Blocking calls are a natural form of back pressure
    - However, a server may need many thread to handle bursty clients

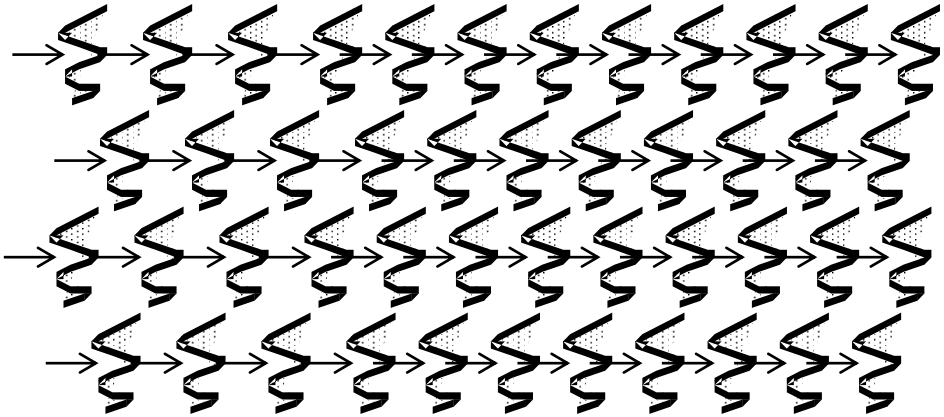


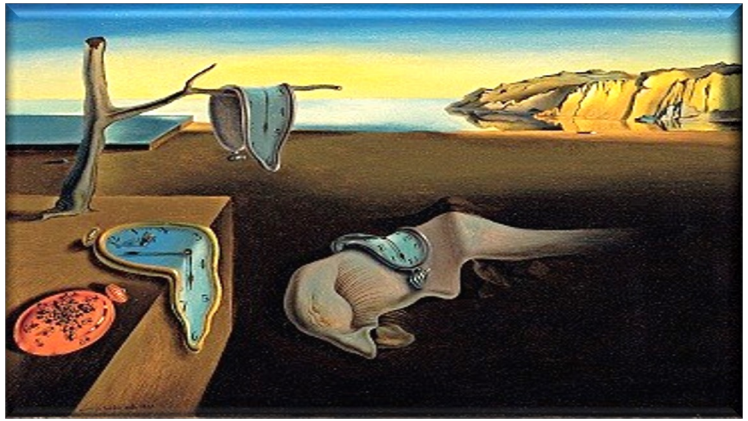


See www.baeldung.com/java-web-thread-pool-config

Overview of Spring WebMVC Communication

- Spring WebMVC concurrency
  - Built on the Servlet API & uses a synchronous I/O architecture w/one-thread-per-request model
    - Each request is handled by a thread that blocks until it is able to fully process the request
      - Blocking calls are a natural form of back pressure
      - However, a server may need many thread to handle bursty clients
      - The client may need thread too

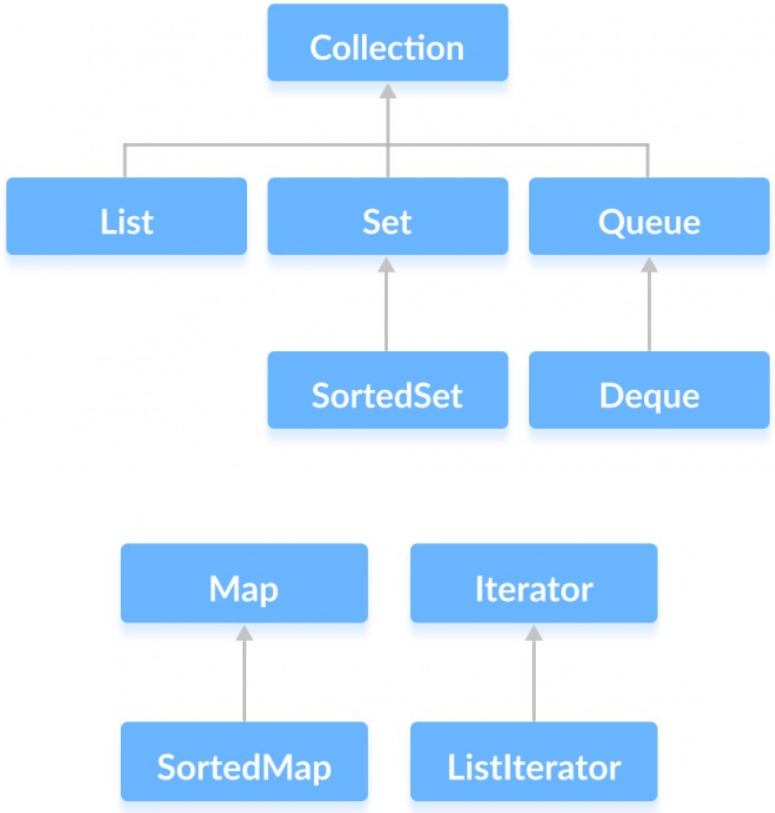




Overview of Spring WebMVC Communications

Overview of Spring WebMVC Communication

- Spring WebMVC communications
  - Network communication uses common Java types



See docs.oracle.com/javase/8/docs/technotes/guides/collections/overview.html

Overview of Spring WebMVC Communication

- Spring WebMVC communications
  - Network communication uses common Java types
    - e.g., Java String & Integer objects, as well as List & Map collections

```
public class FlightController {
   ...
   @GetMapping(FLIGHT_DATES)
   List<LocalDate>
      findDepartureDates
         (@RequestParam String
           departureAirport,
          @RequestParam String
           arrivalAirport)
   { ... }
   ...
}
```

See flights-microservices/-/blob/master/src/main/java/server/flight/FlightController.java

Overview of Spring WebMVC Communication

- Spring WebMVC communications
  - Network communication uses common Java types
  - WebMVC endpoints send & return Java collections in one fell swoop

Overview of Spring WebMVC Communication

- Spring WebMVC communications
  - Network communication uses common Java types
  - WebMVC endpoints send & return Java collections in one fell swoop
    - Client latency may suffer & thus not be as responsive as possible

See en.wikipedia.org/wiki/Spinning_pinwheel

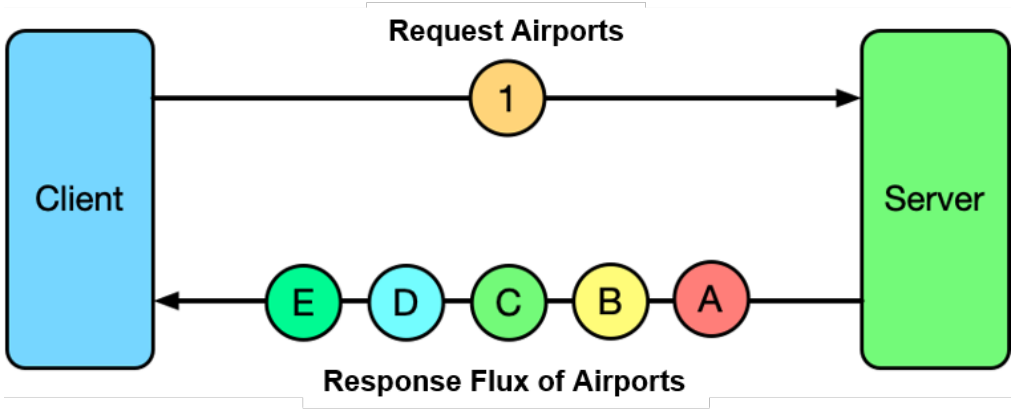
Overview of Spring WebMVC Communication

- Spring WebMVC communications
  - Network communication uses common Java types
  - WebMVC endpoints send & return Java collections in one fell swoop
    - Client latency may suffer & thus not be as responsive as possible
    - Memory is needed to buffer this data at multiple points

See english.stackexchange.com/questions/337497/what-is-meant-by-memory-hog

Overview of Spring WebMVC Communication

- Spring WebMVC communications
  - Network communication uses common Java types
  - WebMVC endpoints send & return Java collections in one fell swoop
    - Client latency may suffer & thus not be as responsive as possible
    - Memory is needed to buffer this data at multiple points
    - Addressed by Spring WebFlux & reactive programming



See docs.spring.io/spring-framework/docs/current/reference/html/web-reactive.html#webflux

End of Overview of Spring WebMVC