The Flight Listing App (FLApp) Case Study

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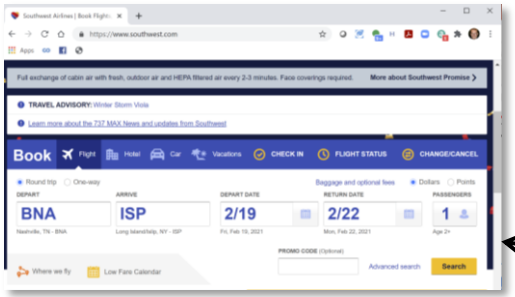
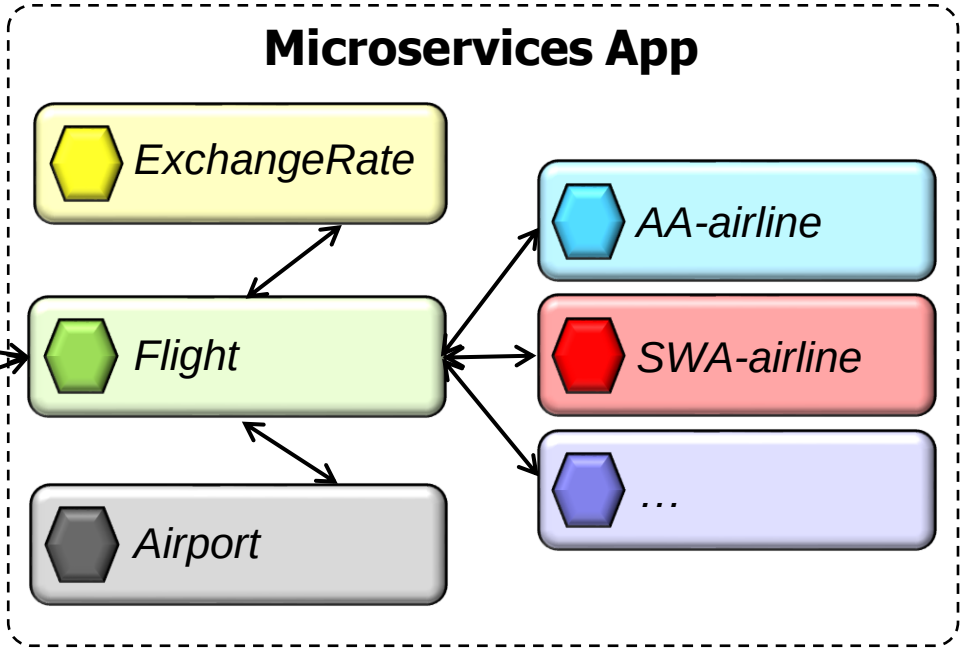
Learning Objectives in this Lesson

- Understand how object-oriented, functional, & reactive streams programming is applied in a case study that lists airline flights via various web apps



Clients



Overview of the Flight Listing App (FLApp)

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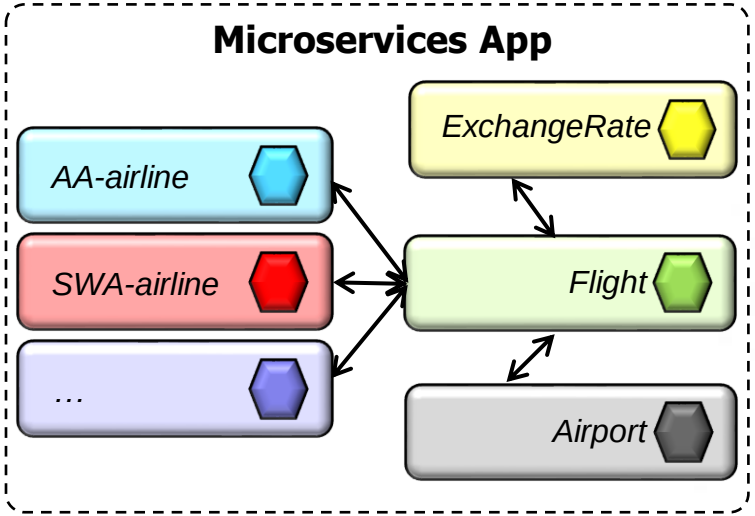
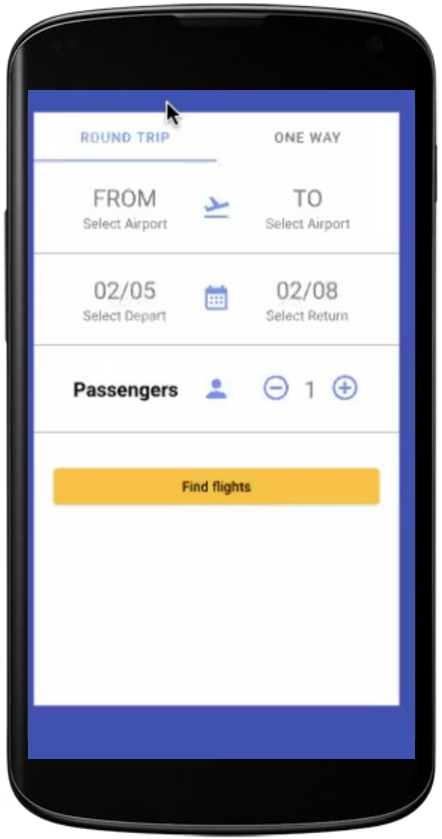
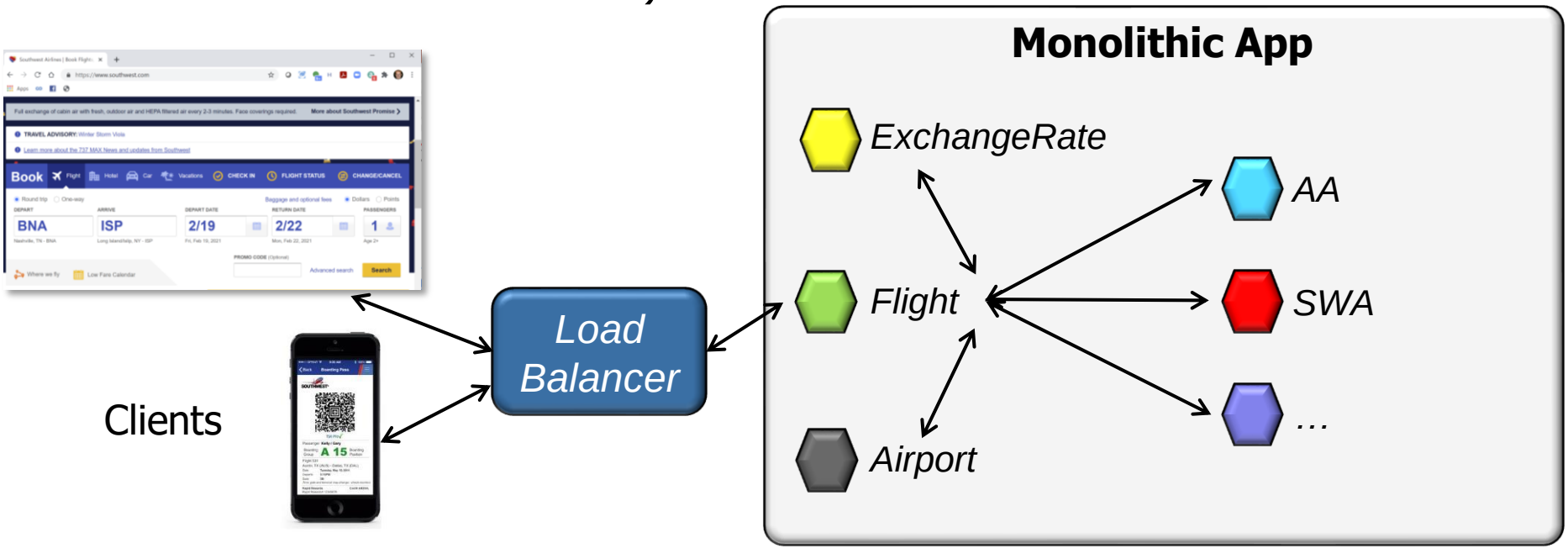
- The Flight Listing App (FLApp) case study showcases a wide range of Java concurrency & parallelism frameworks that synchronously & asynchronously communicate with various Spring-based platforms to list airline flights





Overview of the Flight Listing App (FLApp)

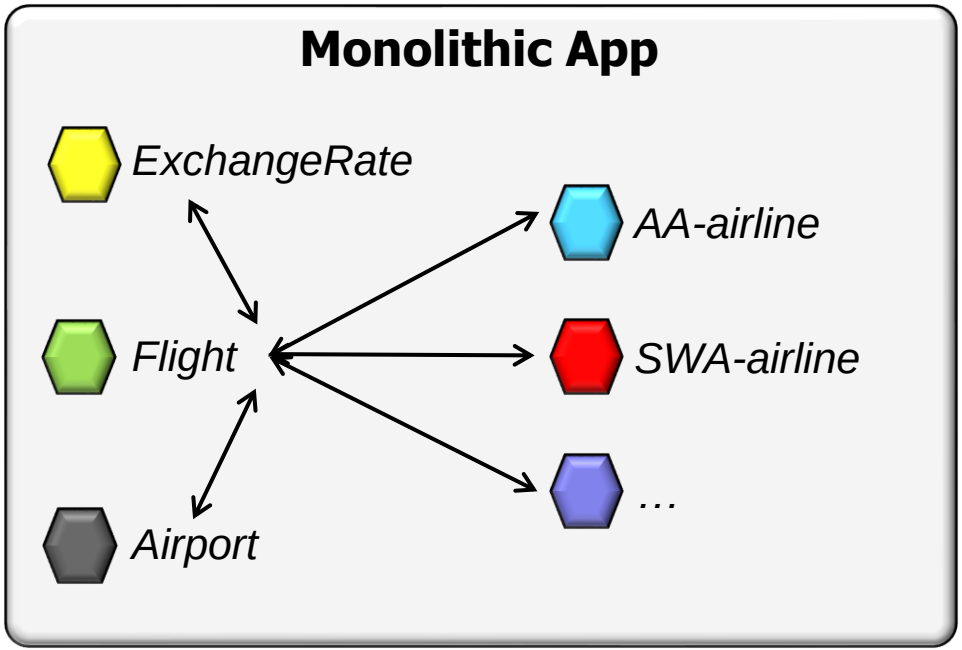
- FLApp provides a monolithic client-server architecture implemented via Spring to sequentially list airline flights using objects within one process (which could be accessed via a load balancer)



See gitlab.com/Creasor/flights-monolithic

Overview of the Flight Listing App (FLApp)

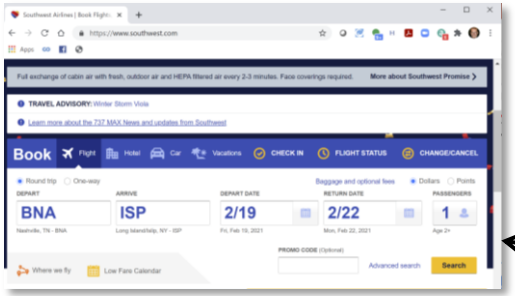
- The monolithic implementation of FLApp uses sync two-way calls & Java object-oriented programming features & functional sequential streams



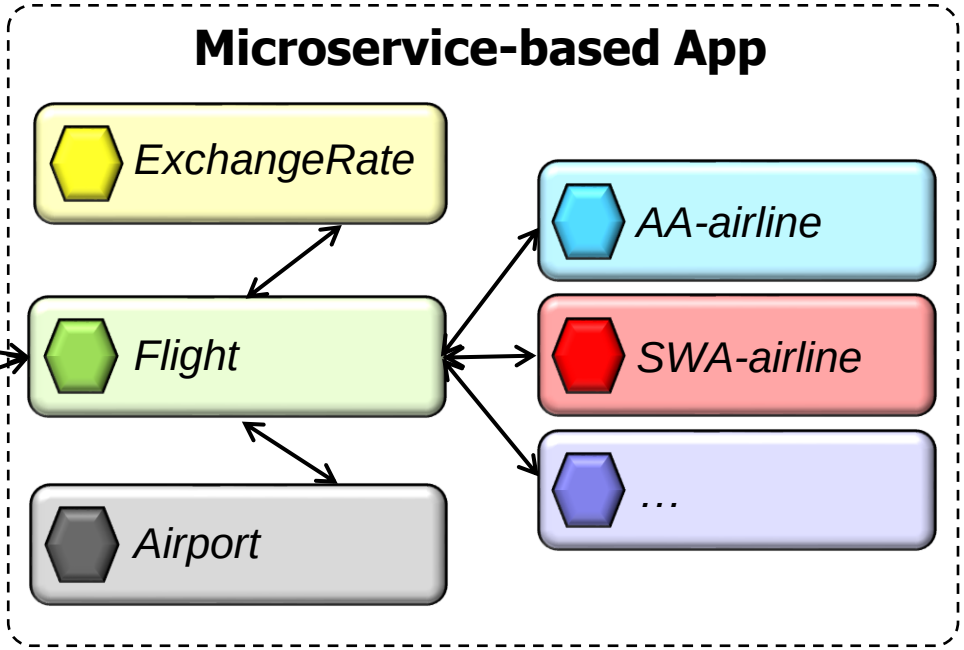
See docs.oracle.com/javase/tutorial/collections/streams

Overview of the Flight Listing App (FLApp)

- Later FLApp versions list airline flights & related information via Spring microservices that can run in separate processes in a cluster environment



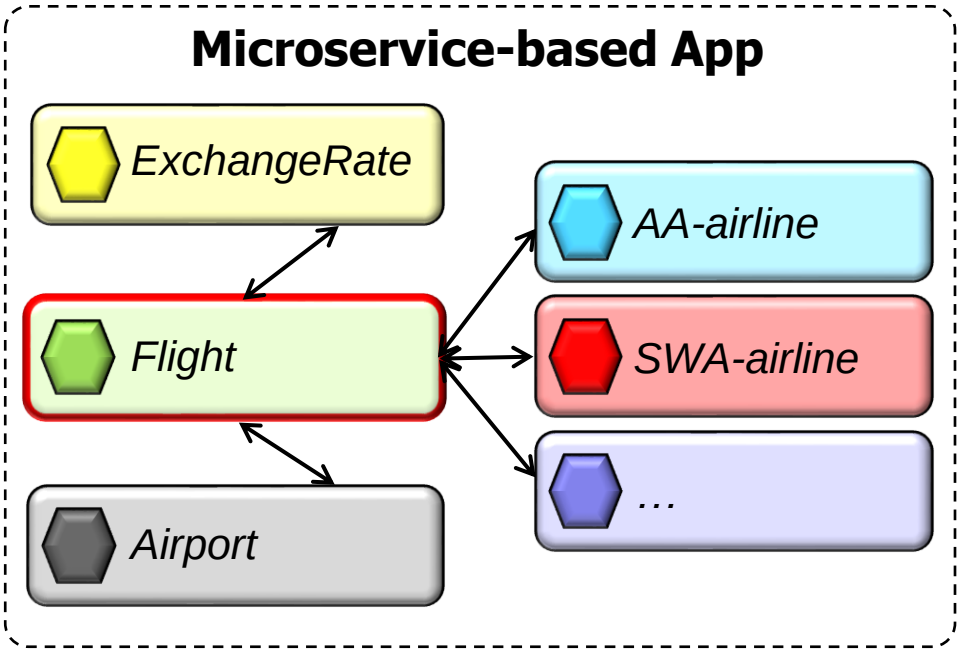
Clients



See gitlab.com/Creasor/flights-microservices & gitlab.com/Creasor/flights-reactive-microservices

Overview of the Flight Listing App (FLApp)

- Later FLApp versions list airline flights & related information via Spring microservices that can run in separate processes in a cluster environment
  - Flight is a "front-end" app gateway that uses Eureka service discovery



See www.baeldung.com/spring-cloud-netflix-eureka

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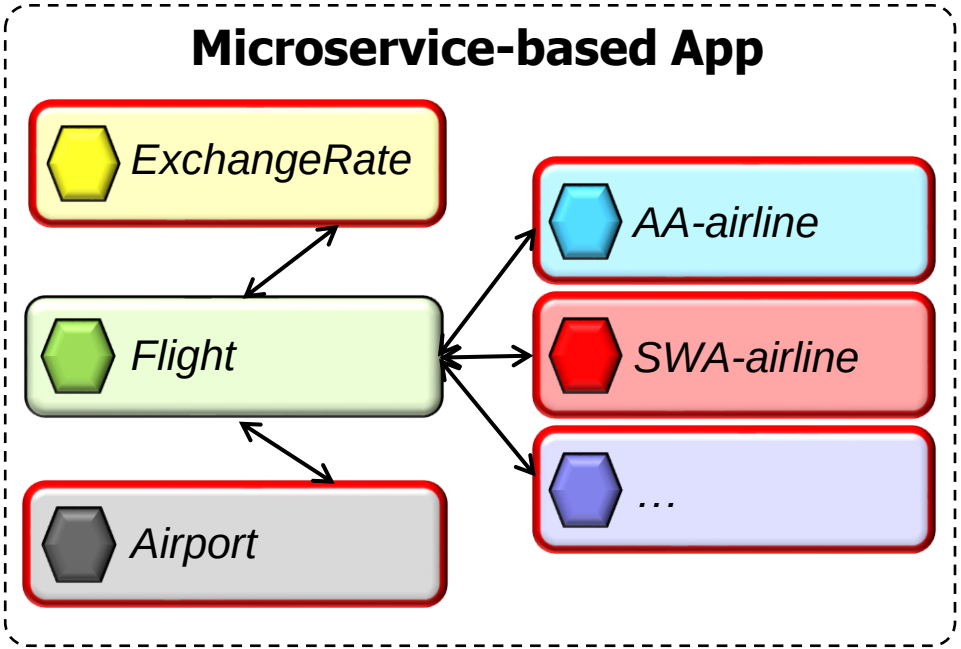
- Later FLApp versions list airline flights & related information via Spring microservices that can run in separate processes in a cluster environment
  - Flight is a "front-end" app gateway that uses Eureka service discovery
    - Used to find & communicate with back-end microservices
      - Without hard-coding ports & hostnames



See microservices.io/patterns/server-side-discovery.html

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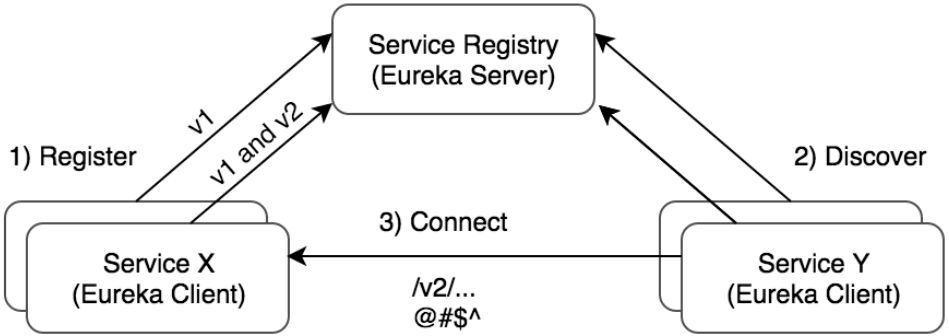
    - Used to find & communicate with back-end microservices
      - Without hard-coding ports & hostnames
      - Each back-end microservice registers with a service registry



See microservices.io/patterns/service-registry.html

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  - Flight is a "front-end" app gateway that uses Eureka service discovery
    - Used to find & communicate with back-end microservices
      - Without hard-coding ports & hostnames
    - Each back-end microservice registers with a service registry
      - Performed declaratively via annotations & property files

```
...
@EnableDiscoveryClient
public class AirportApplication {
public static void main(...) {
  SpringApplication.run
    (AirportApplication.class,a);
  }
...

server.port=0
eureka.client.serviceUrl.defaultZone
    =http://localhost:8761/eureka
spring.cloud.eureka.enabled=true
eureka.client.enabled=true
...
```

See microservices.io/patterns/service-registry.html

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    - The Flight app gateway can locate the microservices it uses by name

```
List<String>
getAirlineServices() {
  return discoveryClient
    .getServices()

    .stream()

    .filter(id -> id
       .toLowerCase()
       .contains("airline"))

    .collect(toList());
```

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    - RestTemplate performs sync calls

```
Airport[] airports =
  restTemplate
    .getForEntity("http://"
                  + AIRPORT
                  + "/"
                  + AIRPORTS,
                  Airport[]
                  .class)
    .getBody();
```

See springframework/web/client/RestTemplate.html

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    - It uses Eureka to redirects HTTP requests to the microservice

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See microservice-registration-and-discovery-with-spring-cloud-and-netflix-s-eureka

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    - RestTemplate performs sync calls
      - It uses Eureka to redirects HTTP requests to the microservice
        - Load balancing can also be enabled!

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See piotrminkowski.com/2020/05/13/a-deep-dive-into-spring-cloud-load-balancer

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    - The Flight app gateway can locate the microservices it uses by name
    - RestTemplate performs sync calls
    - WebClient performs async calls

```
webClient
   .get()
   .uri(baseUrl + AIRPORT
         + "/" + AIRPORTS)
   .retrieve()
   .bodyToFlux(Airport.class);
```

See springframework/web/reactive/function/client/WebClient.html

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    - RestTemplate performs sync calls
    - WebClient performs async calls
      - It also uses Eureka & load balanding

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See spring.io/blog/2020/03/25/spring-tips-spring-cloud-loadbalancer

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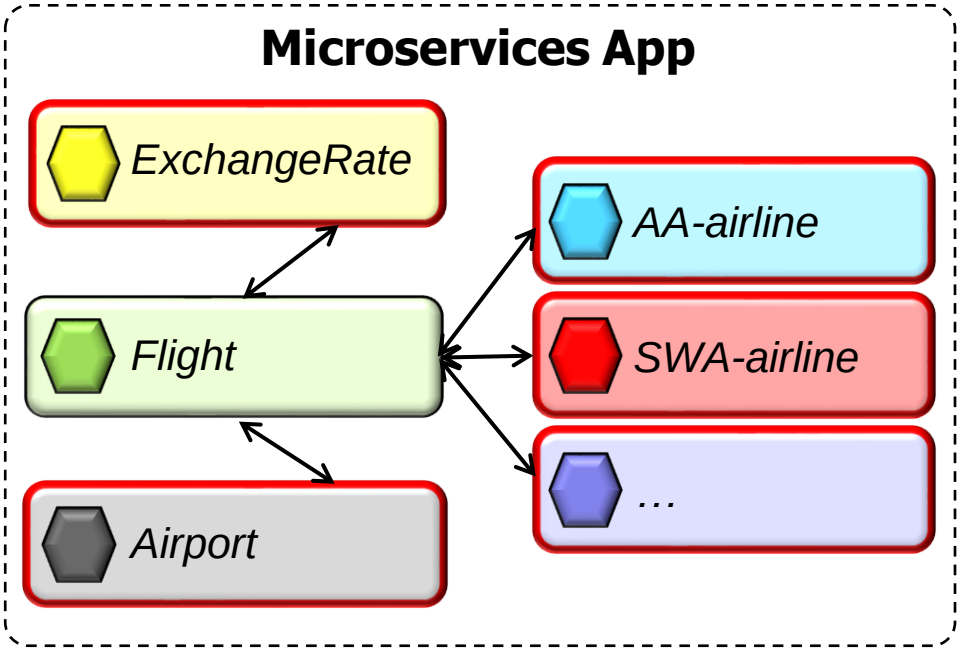
  - The "back-end" microservices perform various tasks



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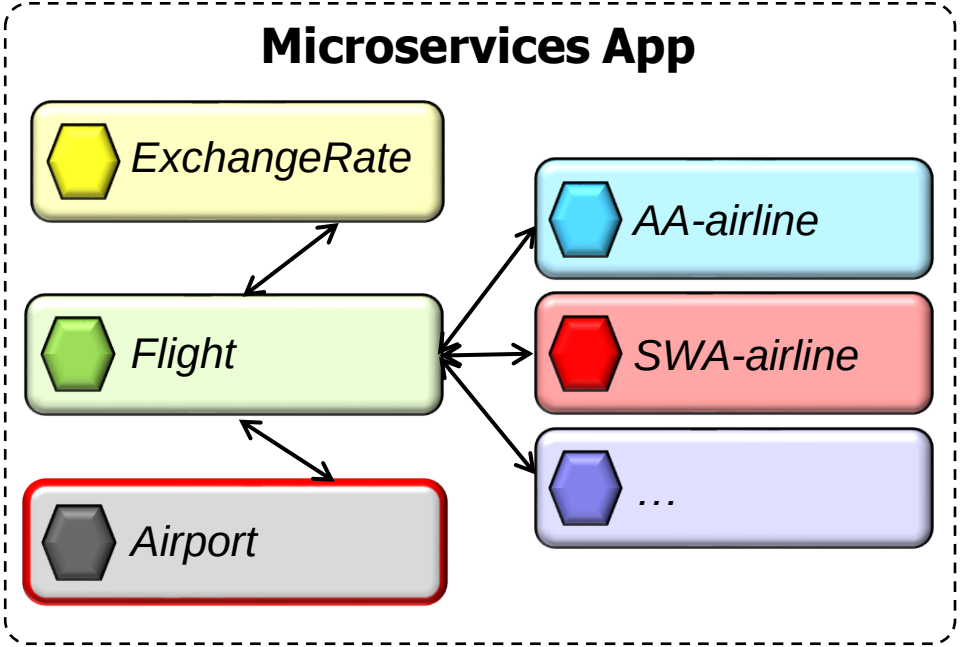
    - Return a list of all known airports



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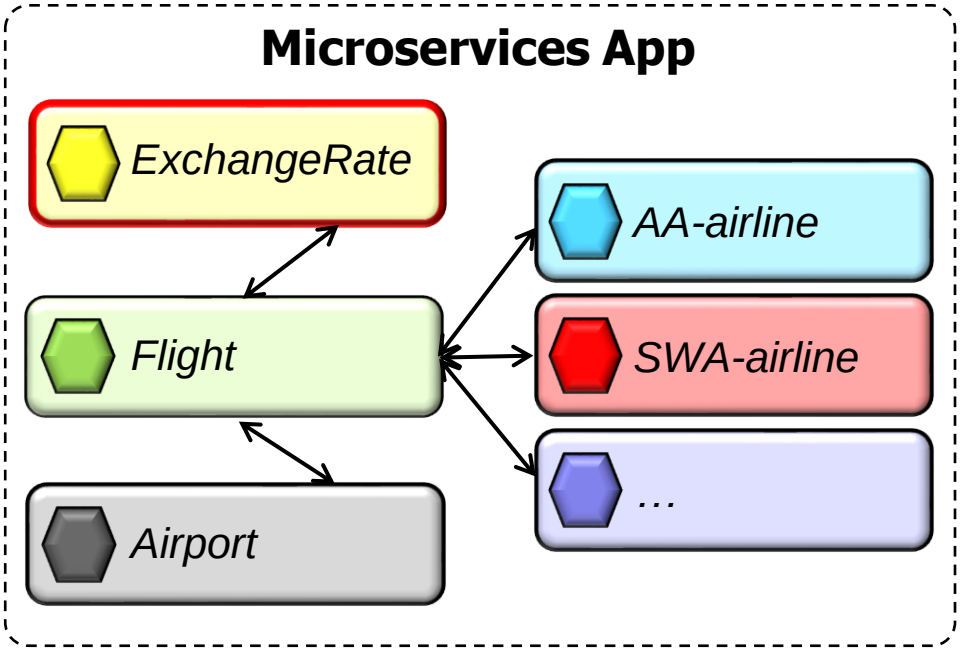
    - Return a list of all known airports
    - Return currency exchange rates



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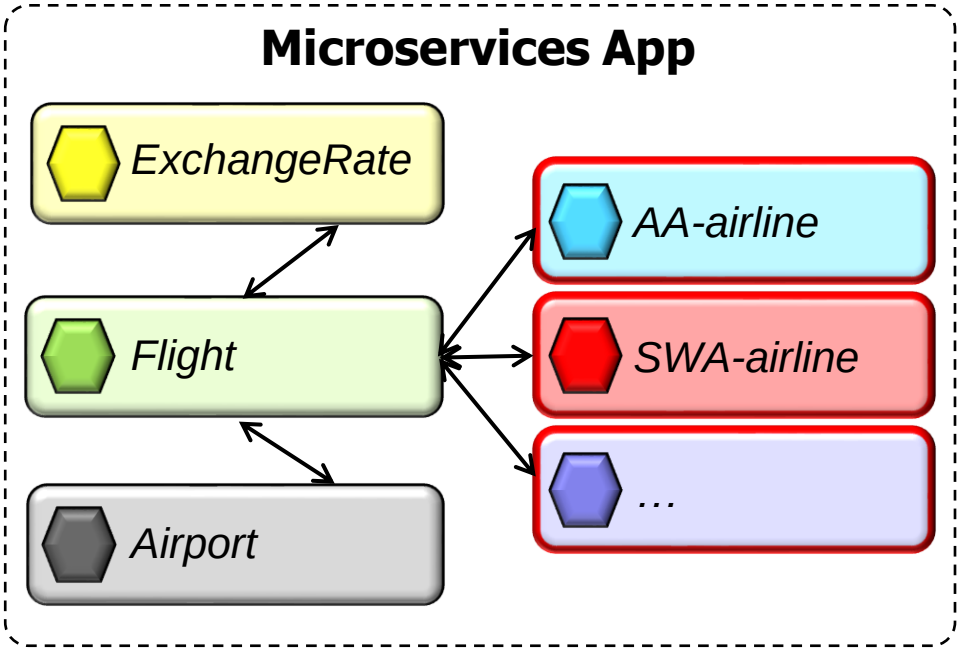
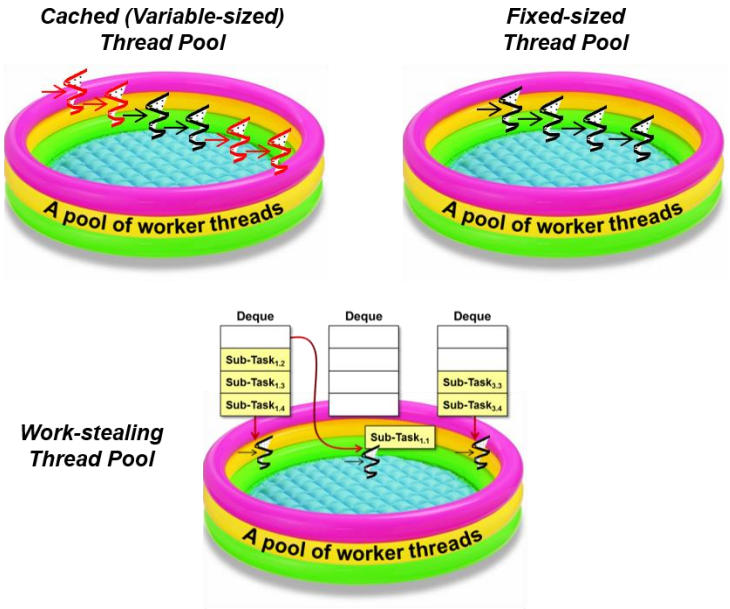
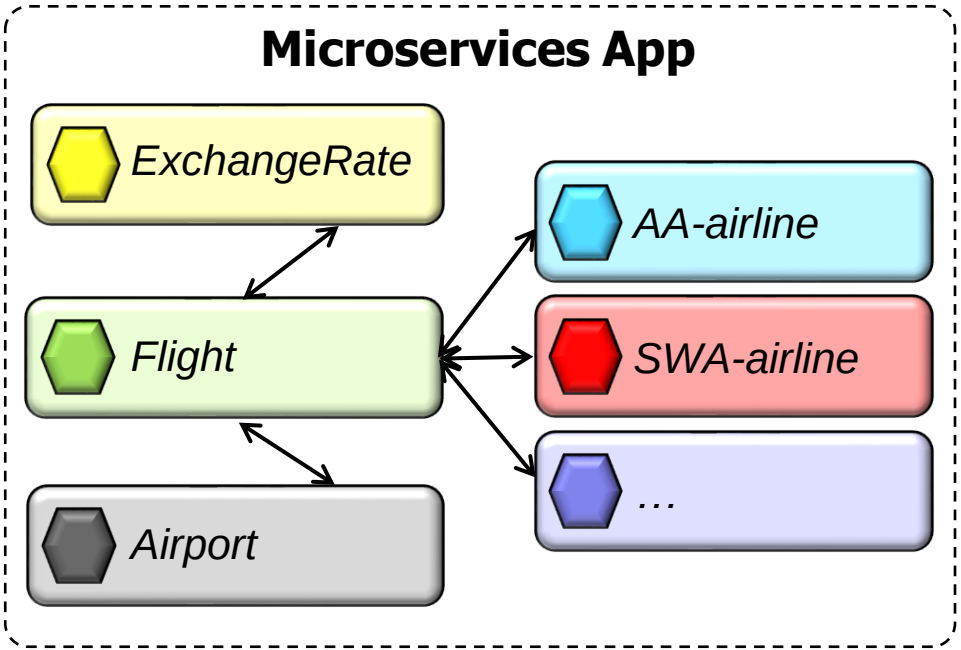
  - Flight is a "front-end" app gateway that uses Eureka service discovery
  - The "back-end" microservices perform various tasks, e.g.
    - Return a list of all known airports
    - Return currency exchange rates
    - Return flight info for various airlines



Overview of the Flight Listing App (FLApp)

- The object-oriented implementation of FLApp uses sync two-way calls & various Java concurrent Executor frameworks
  - e.g., Java threads & the Java executor framework

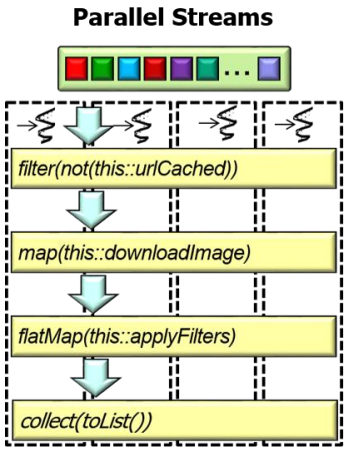


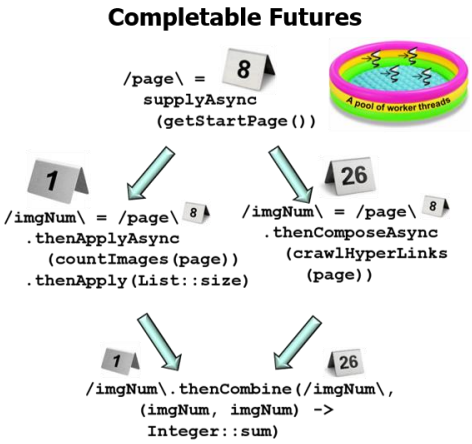


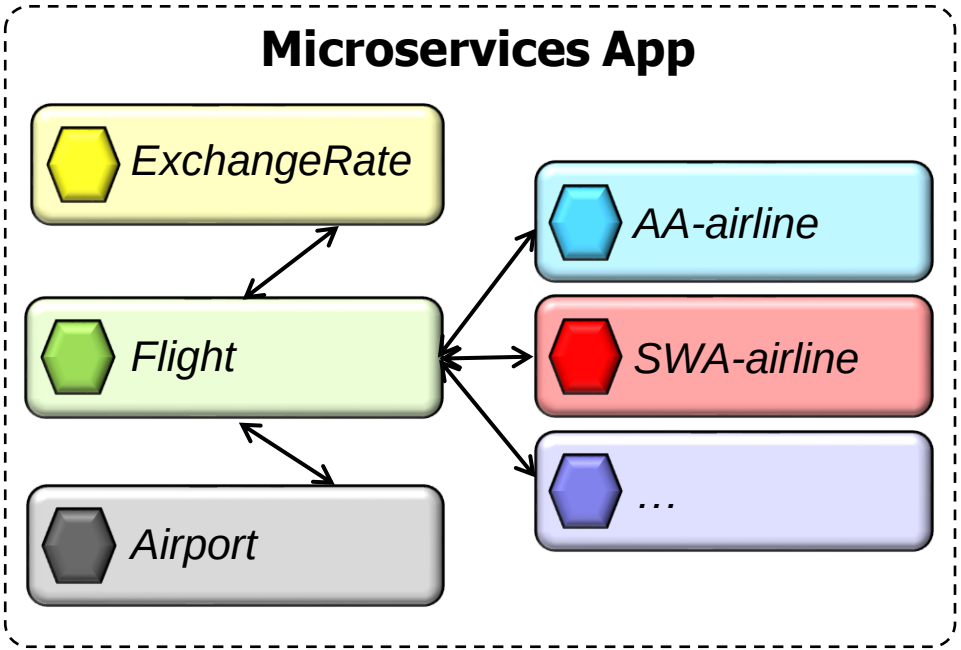
See docs.oracle.com/javase/tutorial/essential/concurrency

Overview of the Flight Listing App (FLApp)

- The functional implementation of FLApp uses sync & async two-way calls & various Java functional parallel & async programming frameworks
  - e.g., Java parallel streams & completable futures frameworks



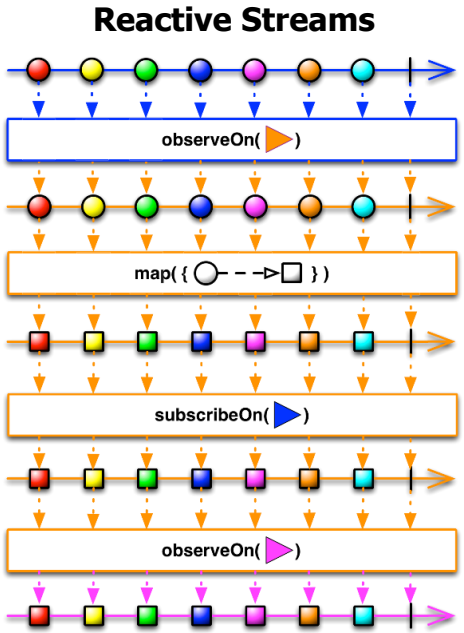


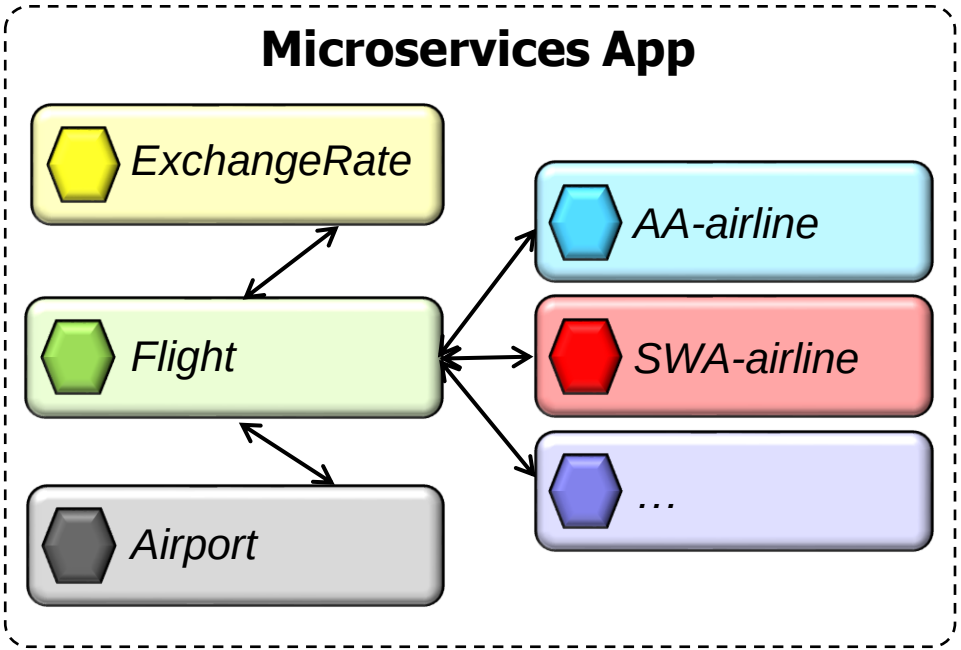


See www.manning.com/books/modern-java-in-action

Overview of the Flight Listing App (FLApp)

- The reactive implementation of FLApp uses async two-way calls & various Java reactive streams frameworks that support various concurrency models
  - e.g., Project Reactor & RxJava





See en.wikipedia.org/wiki/Reactive_Streams

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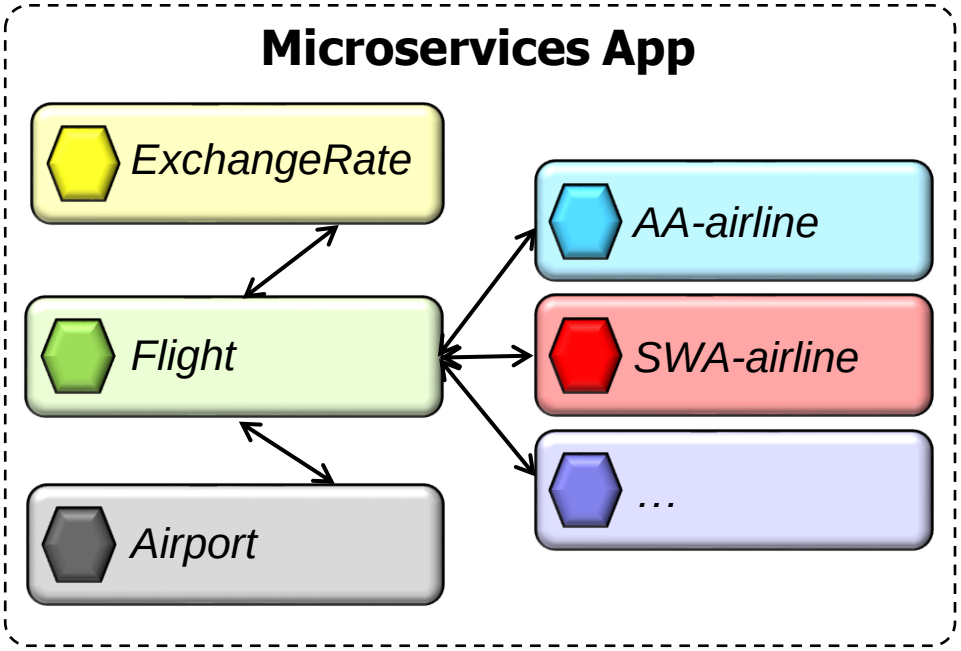
- The FLApp case study also showcases advanced GUI, persistence, & testing frameworks & tools
  - e.g., JPA, R2DBC, Android, & mocking tools



See spring.io/projects/spring-data-jpa, r2dbc.io, developer.android.com & mockk.io

End of the Flight Listing App (FLApp) Case Study