(../..)

Requirements

Lab Requirements (../requirements)

Purpose of this lab

- How to protect your application (`greeting-hystrix`) from failures or latency with the circuit breaker pattern
- How to publish circuit-breaking metrics from your application (`greeting-hystrix`)
- How to consume metric streams with the `hystrix-dashboard`
- Estimated Time: 25 minutes

Start the `config-server`, `service-registry`, and `fortune-service`

1. Start the `config-server` in a terminal window. You may have terminal windows still open from previous labs. They may be reused for this lab.

   ```
   cd ~/workspace/apps-spring-cloud-services-code/config-server
   mvn clean spring-boot:run
   ```

2. Start the `service-registry`

   ```
   cd ~/workspace/apps-spring-cloud-services-code/service-registry
   mvn clean spring-boot:run
   ```

3. Start the `fortune-service`

```
cd ~/workspace/apps-spring-cloud-services-code/fortune-service
mvn clean spring-boot:run
```

Set up `greeting-hystrix`

1. Review the `cd ~/workspace/apps-spring-cloud-services-code/greeting-hystrix/pom.xml` file. Note that `spring-cloud-services-starter-circuit-breaker` has been added to the classpath, making this application eligible to use circuit breakers via Hystrix.

   ```
   <dependency>
       <groupId>io.pivotal.spring.cloud</groupId>
       <artifactId>spring-cloud-services-starter-circuit-breaker</art
   ifactId>
   </dependency>
   ```

2. Review the following file: `cd ~/workspace/apps-spring-cloud-services-code/greeting-hystrix/src/main/java/io/pivotal/GreetingHystrixApplication.java`. Note the use of the `@EnableCircuitBreaker` annotation. This allows the application to create circuit breakers.
   Note also how we again configure our `RestTemplate` bean to be load-balanced.

   ```
   @SpringBootApplication
   @EnableDiscoveryClient
   @EnableCircuitBreaker
   public class GreetingHystrixApplication {

       public static void main(String[] args) {
           SpringApplication.run(GreetingHystrixApplication.class,
   args);
       }

       @LoadBalanced
       @Bean
       RestTemplate restTemplate() {
           return new RestTemplate();
       }
   }
   ```

3. Review the following file: `cd ~/workspace/apps-spring-cloud-services-code/greeting-hystrix/src/main/java/io/pivotal/fortune/FortuneService.java`. Note the use of the `@HystrixCommand`.
   This is our circuit breaker.
   If `getFortune()` fails, a fallback method `defaultFortune` will be invoked.

```
@Service
public class FortuneService {

    private Logger logger = LoggerFactory.getLogger(getClass());
    private RestTemplate restTemplate;

    @Autowired
    public FortuneService(RestTemplate restTemplate) {
        this.restTemplate = restTemplate;
    }


    @HystrixCommand(fallbackMethod = "defaultFortune")
    public String getFortune() {
        return restTemplate.getForObject("http://fortune-service",
String.class);
    }

    public String defaultFortune() {
        logger.debug("Default fortune used.");
        return "This fortune is no good. Try another.";
    }
}
```

4. Open a new terminal window. Start the `greeting-hystrix`

```
cd ~/workspace/apps-spring-cloud-services-code/greeting-hystrix
mvn clean spring-boot:run
```

5. Refresh the `greeting-hystrix` `/` endpoint. You should get fortunes from the `fortune-service`.

6. Stop the `fortune-service`. Refresh the `greeting-hystrix` `/` endpoint again. The default fortune is given.

7. Restart the `fortune-service`.
   Refresh the `greeting-hystrix` `/` endpoint.
   After some time, fortunes from the `fortune-service` are back.

What Just Happened?

The circuit breaker insulated `greeting-hystrix` from failures when the `fortune-service` was not available. This results in a better experience for our users and can also prevent cascading failures.

Set up the `greeting-hystrix` metric stream

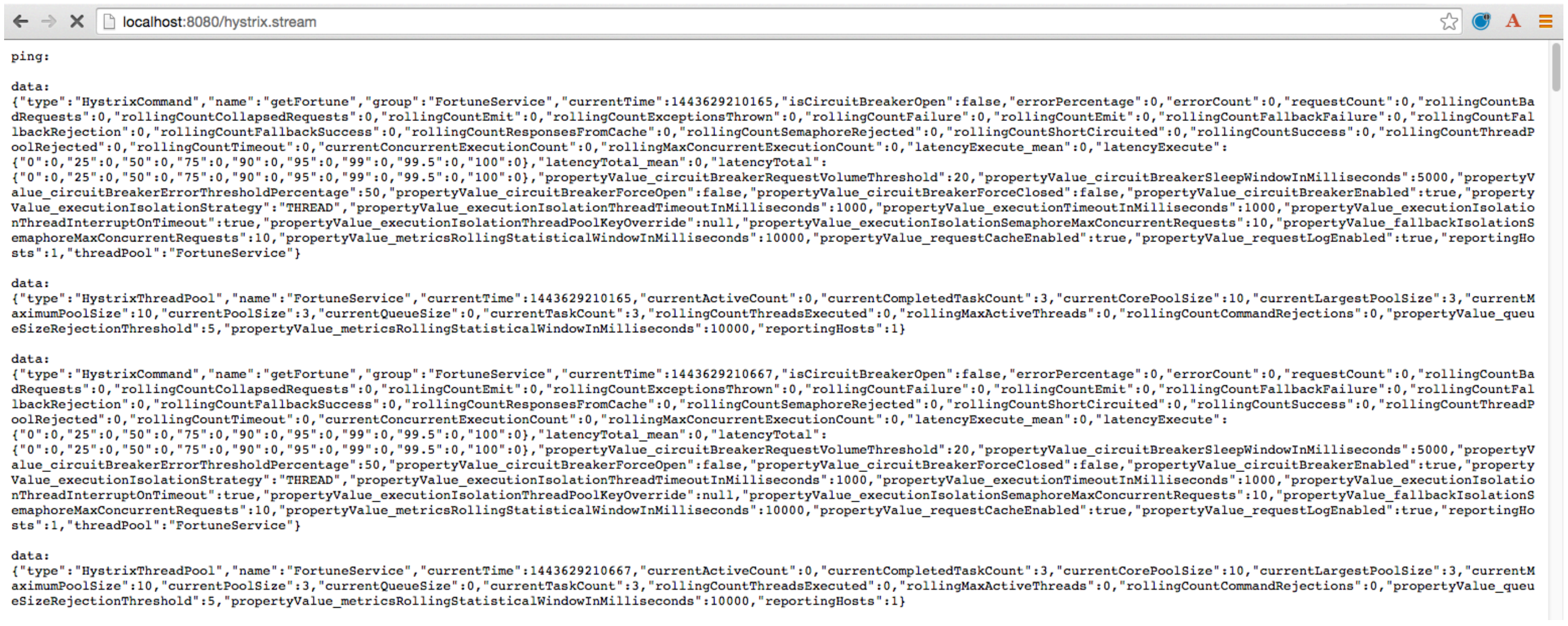
Being able to monitor the state of our circuit breakers is highly valuable, but first the `greeting-hystrix` application must expose its metrics.

This is accomplished by including the `actuator` dependency in the `greeting-hystrix` `pom.xml`.

1. Review the `cd ~/workspace/apps-spring-cloud-services-code/greeting-hystrix/pom.xml` file. The `spring-boot-starter-actuator` on the classpath will publish metrics at the `/hystrix.stream` endpoint.

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-actuator</artifactId>
</dependency>
```

2. Browse to http://localhost:8080/hystrix.stream (http://localhost:8080/hystrix.stream) to review the metric stream.



```
ping:

data:
{"type":"HystrixCommand","name":"getFortune","group":"FortuneService","currentTime":1443629210165,"isCircuitBreakerOpen":false,"errorPercentage":0,"errorCount":0,"requestCount":0,"rollingCountBadRequests":0,"rollingCountCollapsedRequests":0,"rollingCountEmit":0,"rollingCountExceptionsThrown":0,"rollingCountFailure":0,"rollingCountEmit":0,"rollingCountFallbackFailure":0,"rollingCountFallbackRejection":0,"rollingCountFallbackSuccess":0,"rollingCountResponsesFromCache":0,"rollingCountSemaphoreRejected":0,"rollingCountShortCircuited":0,"rollingCountSuccess":0,"rollingCountThreadPoolRejected":0,"rollingCountTimeout":0,"currentConcurrentExecutionCount":0,"rollingMaxConcurrentExecutionCount":0,"latencyExecute_mean":0,"latencyExecute":
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{"0":0,"25":0,"50":0,"75":0,"90":0,"95":0,"99":0,"99.5":0,"100":0},"propertyValue_circuitBreakerRequestVolumeThreshold":20,"propertyValue_circuitBreakerSleepWindowInMilliseconds":5000,"propertyValue_circuitBreakerErrorThresholdPercentage":50,"propertyValue_circuitBreakerForceOpen":false,"propertyValue_circuitBreakerForceClosed":false,"propertyValue_circuitBreakerEnabled":true,"propertyValue_executionIsolationStrategy":"THREAD","propertyValue_executionIsolationThreadTimeoutInMilliseconds":1000,"propertyValue_executionTimeoutInMilliseconds":1000,"propertyValue_executionIsolationThreadInterruptOnTimeout":true,"propertyValue_executionIsolationThreadPoolKeyOverride":null,"propertyValue_executionIsolationSemaphoreMaxConcurrentRequests":10,"propertyValue_fallbackIsolationSemaphoreMaxConcurrentRequests":10,"propertyValue_metricsRollingStatisticalWindowInMilliseconds":10000,"propertyValue_requestCacheEnabled":true,"propertyValue_requestLogEnabled":true,"reportingHosts":1,"threadPool":"FortuneService"}

data:
{"type":"HystrixThreadPool","name":"FortuneService","currentTime":1443629210165,"currentActiveCount":0,"currentCompletedTaskCount":3,"currentCorePoolSize":10,"currentLargestPoolSize":3,"currentMaximumPoolSize":10,"currentPoolSize":3,"currentQueueSize":0,"currentTaskCount":3,"rollingCountThreadsExecuted":0,"rollingMaxActiveThreads":0,"rollingCountCommandRejections":0,"propertyValue_queueSizeRejectionThreshold":5,"propertyValue_metricsRollingStatisticalWindowInMilliseconds":10000,"reportingHosts":1}

data:
{"type":"HystrixCommand","name":"getFortune","group":"FortuneService","currentTime":1443629210667,"isCircuitBreakerOpen":false,"errorPercentage":0,"errorCount":0,"requestCount":0,"rollingCountBadRequests":0,"rollingCountCollapsedRequests":0,"rollingCountEmit":0,"rollingCountExceptionsThrown":0,"rollingCountFailure":0,"rollingCountEmit":0,"rollingCountFallbackFailure":0,"rollingCountFallbackRejection":0,"rollingCountFallbackSuccess":0,"rollingCountResponsesFromCache":0,"rollingCountSemaphoreRejected":0,"rollingCountShortCircuited":0,"rollingCountSuccess":0,"rollingCountThreadPoolRejected":0,"rollingCountTimeout":0,"currentConcurrentExecutionCount":0,"rollingMaxConcurrentExecutionCount":0,"latencyExecute_mean":0,"latencyExecute":
{"0":0,"25":0,"50":0,"75":0,"90":0,"95":0,"99":0,"99.5":0,"100":0},"latencyTotal_mean":0,"latencyTotal":
{"0":0,"25":0,"50":0,"75":0,"90":0,"95":0,"99":0,"99.5":0,"100":0},"propertyValue_circuitBreakerRequestVolumeThreshold":20,"propertyValue_circuitBreakerSleepWindowInMilliseconds":5000,"propertyValue_circuitBreakerErrorThresholdPercentage":50,"propertyValue_circuitBreakerForceOpen":false,"propertyValue_circuitBreakerForceClosed":false,"propertyValue_circuitBreakerEnabled":true,"propertyValue_executionIsolationStrategy":"THREAD","propertyValue_executionIsolationThreadTimeoutInMilliseconds":1000,"propertyValue_executionTimeoutInMilliseconds":1000,"propertyValue_executionIsolationThreadInterruptOnTimeout":true,"propertyValue_executionIsolationThreadPoolKeyOverride":null,"propertyValue_executionIsolationSemaphoreMaxConcurrentRequests":10,"propertyValue_fallbackIsolationSemaphoreMaxConcurrentRequests":10,"propertyValue_metricsRollingStatisticalWindowInMilliseconds":10000,"propertyValue_requestCacheEnabled":true,"propertyValue_requestLogEnabled":true,"reportingHosts":1,"threadPool":"FortuneService"}

data:
{"type":"HystrixThreadPool","name":"FortuneService","currentTime":1443629210667,"currentActiveCount":0,"currentCompletedTaskCount":3,"currentCorePoolSize":10,"currentLargestPoolSize":3,"currentMaximumPoolSize":10,"currentPoolSize":3,"currentQueueSize":0,"currentTaskCount":3,"rollingCountThreadsExecuted":0,"rollingMaxActiveThreads":0,"rollingCountCommandRejections":0,"propertyValue_queueSizeRejectionThreshold":5,"propertyValue_metricsRollingStatisticalWindowInMilliseconds":10000,"reportingHosts":1}
```

Set up `hystrix-dashboard`

The metric stream can be visualized with the Hystrix Dashboard.

1. Review the `cd ~/workspace/apps-spring-cloud-services-code/hystrix-dashboard/pom.xml` file. The `spring-cloud-starter-hystrix-dashboard` on the classpath enables this application to expose a Hystrix Dashboard.

   ```
   <dependency>
       <groupId>org.springframework.cloud</groupId>
       <artifactId>spring-cloud-starter-hystrix-dashboard</artifactId
   >
   </dependency>
   ```

2. Review the following file: `cd ~/workspace/apps-spring-cloud-services-code/hystrix-dashboard/src/main/java/io/pivotal/HystrixDashboardApplication.java`. Note the use of the `@EnableHystrixDashboard` annotation. This creates a Hystrix Dashboard.

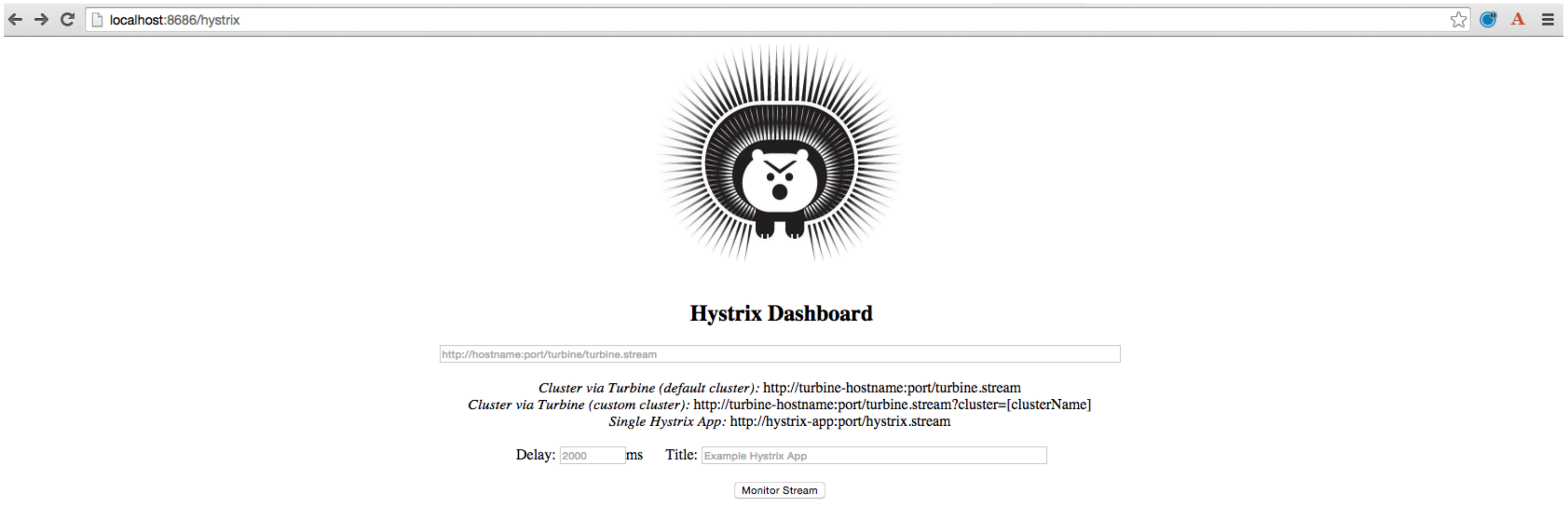
   ```
   @SpringBootApplication
   @EnableHystrixDashboard
   public class HystrixDashboardApplication {

       public static void main(String[] args) {
           SpringApplication.run(HystrixDashboardApplication.class,
   args);
       }
   }
   ```

3. Open a new terminal window. Start the `hystrix-dashboard`

   ```
   cd ~/workspace/apps-spring-cloud-services-code/hystrix-dashboard
   mvn clean spring-boot:run
   ```

4. Open a browser to http://localhost:8686/hystrix (http://localhost:8686/hystrix)


localhost:8686/hystrix

Hystrix Dashboard

http://hostname:port/turbine/turbine.stream

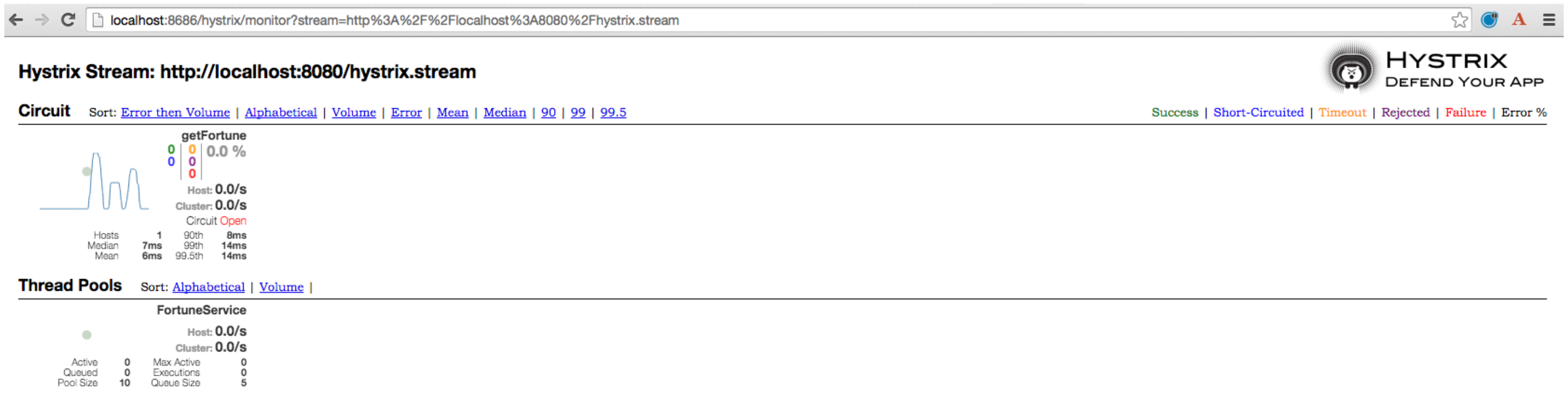
Cluster via Turbine (default cluster): http://turbine-hostname:port/turbine.stream
Cluster via Turbine (custom cluster): http://turbine-hostname:port/turbine.stream?cluster=[clusterName]
Single Hystrix App: http://hystrix-app:port/hystrix.stream

Delay: 2000 ms Title: Example Hystrix App

Monitor Stream

5. Link the `hystrix-dashboard` to the `greeting-hystrix` app. Enter `http://localhost:8080/hystrix.stream` as the stream to monitor.

6. Experiment! Refresh the `greeting-hystrix` `/` endpoint several times. Take down the `fortune-service` app. What does the dashboard do? Review the dashboard doc (https://github.com/Netflix/Hystrix/wiki/Dashboard) for an explanation on metrics.


localhost:8686/hystrix/monitor?stream=http%3A%2F%2Flocalhost%3A8080%2Fhystrix.stream

Hystrix Stream: http://localhost:8080/hystrix.stream

Circuit Sort: Error then Volume | Alphabetical | Volume | Error | Mean | Median | 90 | 99 | 99.5

Success | Short-Circuited | Timeout | Rejected | Failure | Error %

getFortune
0 | 0 | 0.0 %
0 | 0
  | 0
Host: 0.0/s
Cluster: 0.0/s
Circuit Open

```
 Hosts     1    90th    8ms
Median   7ms    99th   14ms
  Mean   6ms  99.5th   14ms
```

Thread Pools Sort: Alphabetical | Volume |

FortuneService
Host: 0.0/s
Cluster: 0.0/s

```
   Active   0   Max Active   0
   Queued   0   Executions   0
Pool Size  10   Queue Size   5
```

(https://pivotal.io)