Pivotal

Observable Microservices

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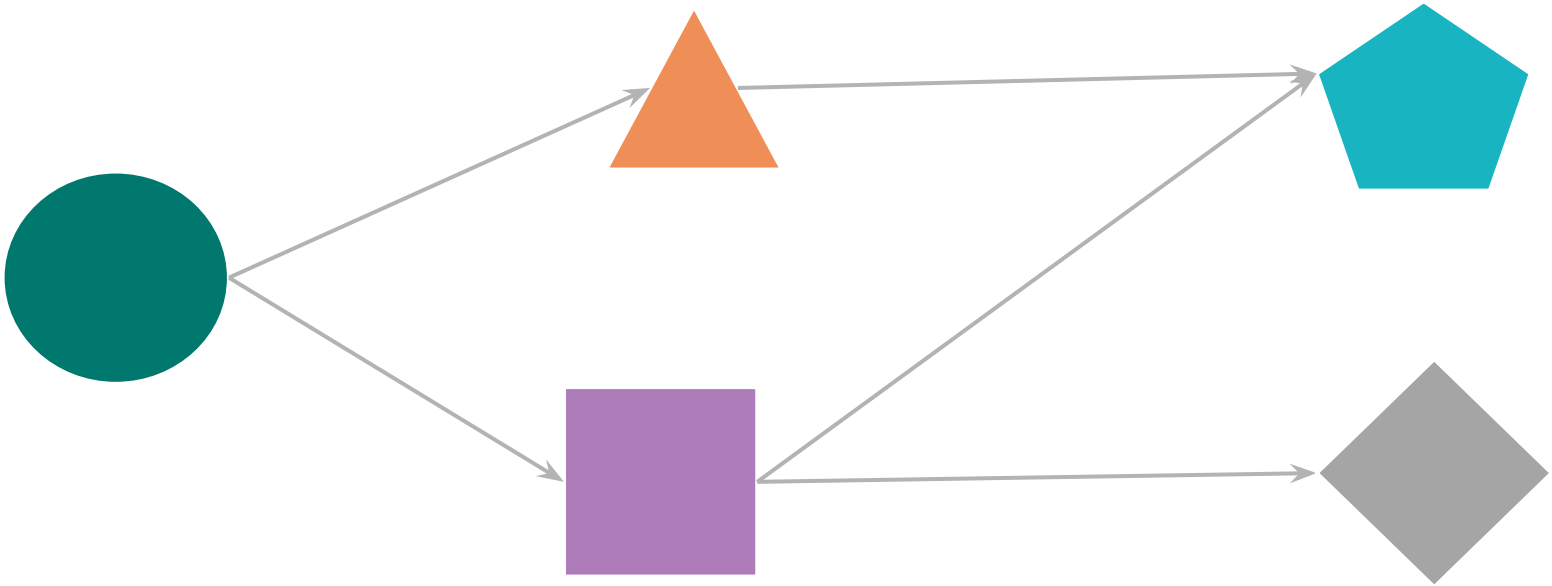
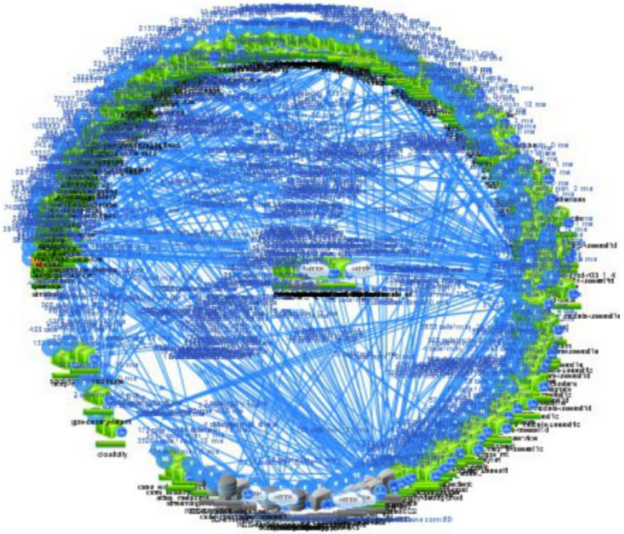
Go to: https://github.com/asaikali/boot-observability
Execute: git pull or clone https://github.com/asaikali/boot-observability.git
Execute: ./mvnw clean package

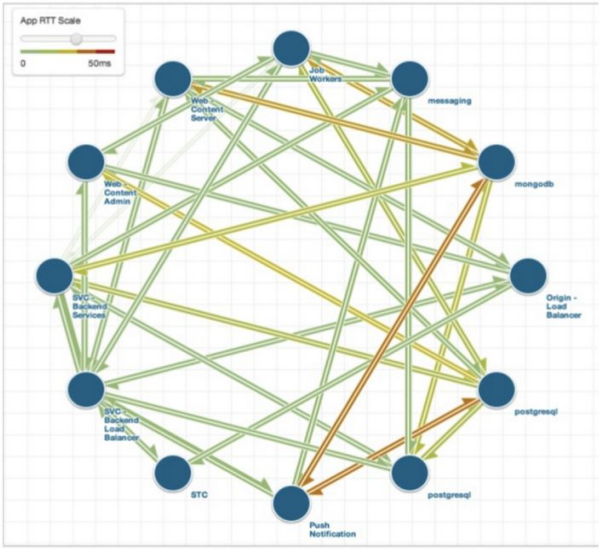
Microservices Compose Other Microservices



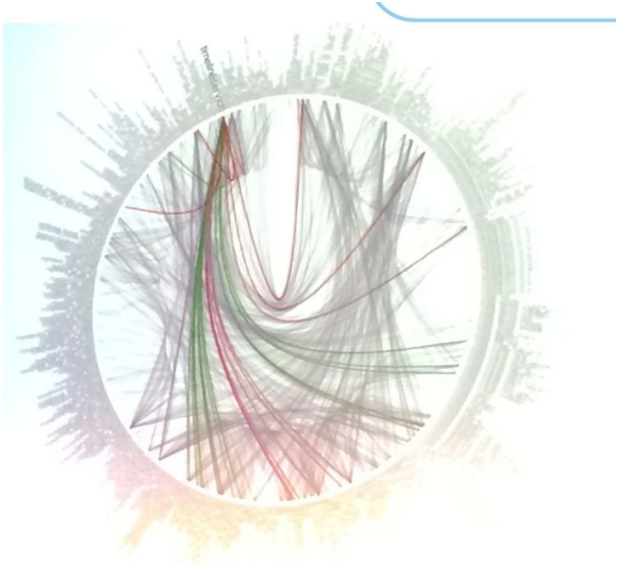
Death Star Architecture



Netflix



Gilt Groupe (12 of 450)



Twitter

As visualized by Appdynamics, Boundary.com and Twitter internal tools

Source: http://www.slideshare.net/adriancockcroft/goto-berlin

Observability According to Wikipedia

"In control theory, **observability is a measure of how well internal states** of a system **can be inferred** from knowledge of its external outputs"

https://en.wikipedia.org/wiki/Observability

Four Types Of Observability

- Logging
- Healthchecks
- Metrics
- Distributed Tracing

Observability

Logging

Traditional Unstructured Logging

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 :: Spring Boot ::        (v2.2.4.RELEASE)

2020-02-18 22:13:15.326  INFO 19548 --- [           main] com.example.MetricsApplication           : Starting MetricsApplication on adib.local with PID 19548 (/Users/adi
2020-02-18 22:13:15.329  INFO 19548 --- [           main] com.example.MetricsApplication           : No active profile set, falling back to default profiles: default
2020-02-18 22:13:16.448  INFO 19548 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port(s): 8080 (http)
2020-02-18 22:13:16.455  INFO 19548 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2020-02-18 22:13:16.455  INFO 19548 --- [           main] org.apache.catalina.core.StandardEngine  : Starting Servlet engine: [Apache Tomcat/9.0.30]
2020-02-18 22:13:16.516  INFO 19548 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApplicationContext
2020-02-18 22:13:16.517  INFO 19548 --- [           main] o.s.web.context.ContextLoader            : Root WebApplicationContext: initialization completed in 1139 ms
2020-02-18 22:13:16.859  INFO 19548 --- [           main] o.s.s.concurrent.ThreadPoolTaskExecutor  : Initializing ExecutorService 'applicationTaskExecutor'
2020-02-18 22:13:17.048  INFO 19548 --- [           main] o.s.b.a.e.web.EndpointLinksResolver      : Exposing 14 endpoint(s) beneath base path '/actuator'
2020-02-18 22:13:17.116  INFO 19548 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port(s): 8080 (http) with context path ''
2020-02-18 22:13:17.119  INFO 19548 --- [           main] com.example.MetricsApplication           : Started MetricsApplication in 2.085 seconds (JVM running for 2.592)
2020-02-18 22:13:17.195  INFO 19548 --- [1)-172.20.0.142] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring DispatcherServlet 'dispatcherServlet'
2020-02-18 22:13:17.195  INFO 19548 --- [1)-172.20.0.142] o.s.web.servlet.DispatcherServlet        : Initializing Servlet 'dispatcherServlet'
2020-02-18 22:13:17.201  INFO 19548 --- [1)-172.20.0.142] o.s.web.servlet.DispatcherServlet        : Completed initialization in 6 ms
```

- Unstructured logs are hard to query and search through, since there is no standard format for the file
- Not possibly to tell from the log statements what version of the code wrote the statement

Structured Logging

- Structured logs are written using a well know format such as JSON that is easy to index
- Structured logs can be easily queried
- Adding the git commit id to every log event makes it possible to determine precisely which version of the code wrote the log message

logs

- Run the structured logging application
- Observe the output of the logs
- Visit the application at `localhost:8080`
- Check the output written to the log
- Examine the `HelloController` and notice how the extra fields are written to the log

Observability

Health Checks

Health checks

- Run the `HealthApplication`
- Visit localhost:8080/actuator/health
- Examine the output
- Visit localhost:8080/fail
- Visit localhost:8080/actuator/health
- Visit localhost:8080/pass
- Visit localhost:8080/actuator/health
- Examine the code in `ExampleHealthIndicator`

Health check Groups

- Visit localhost:8080/actuator/health/foo
- Visit localhost:8080/actuator/health/bar
- Examine `application.yml`

Observability

Distributed Tracing

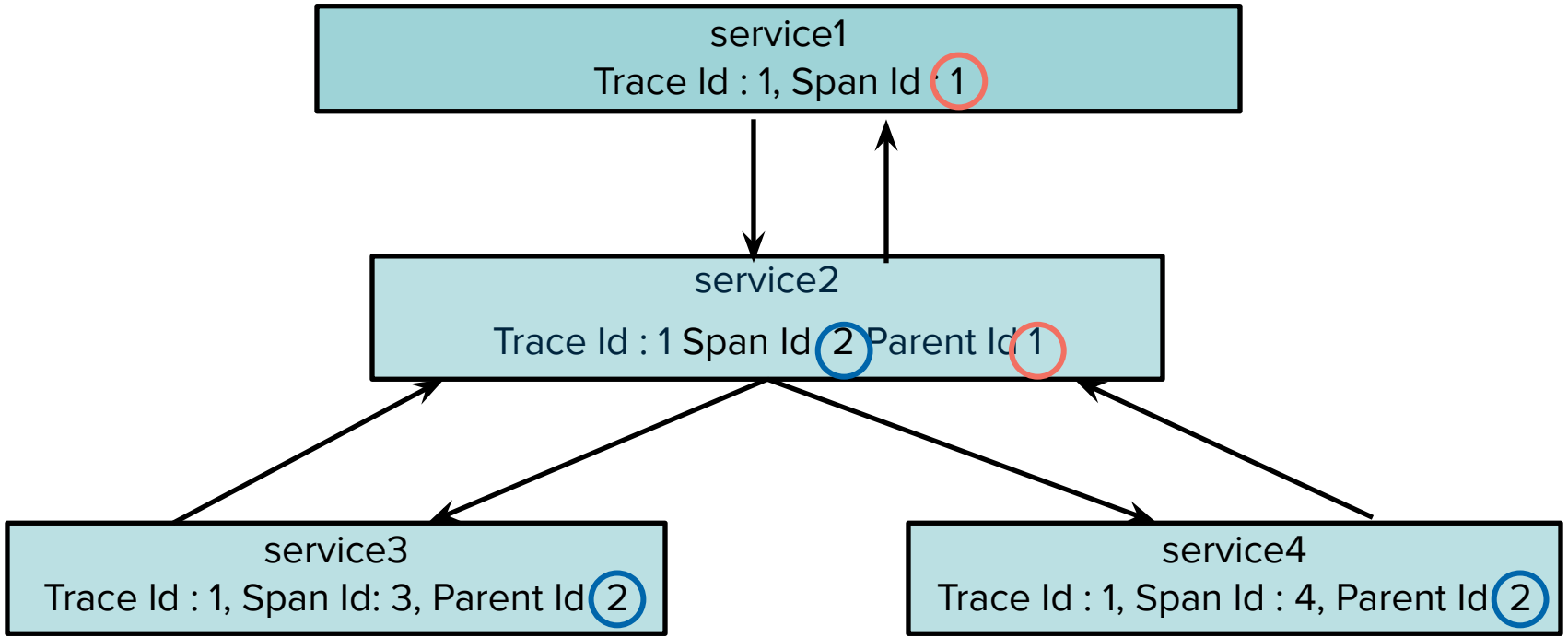
Troubleshooting Latency Issues

- When was the event? How long did it take?
- How do I know it was slow?
- Why did it take so long?
- Which microservice was responsible?

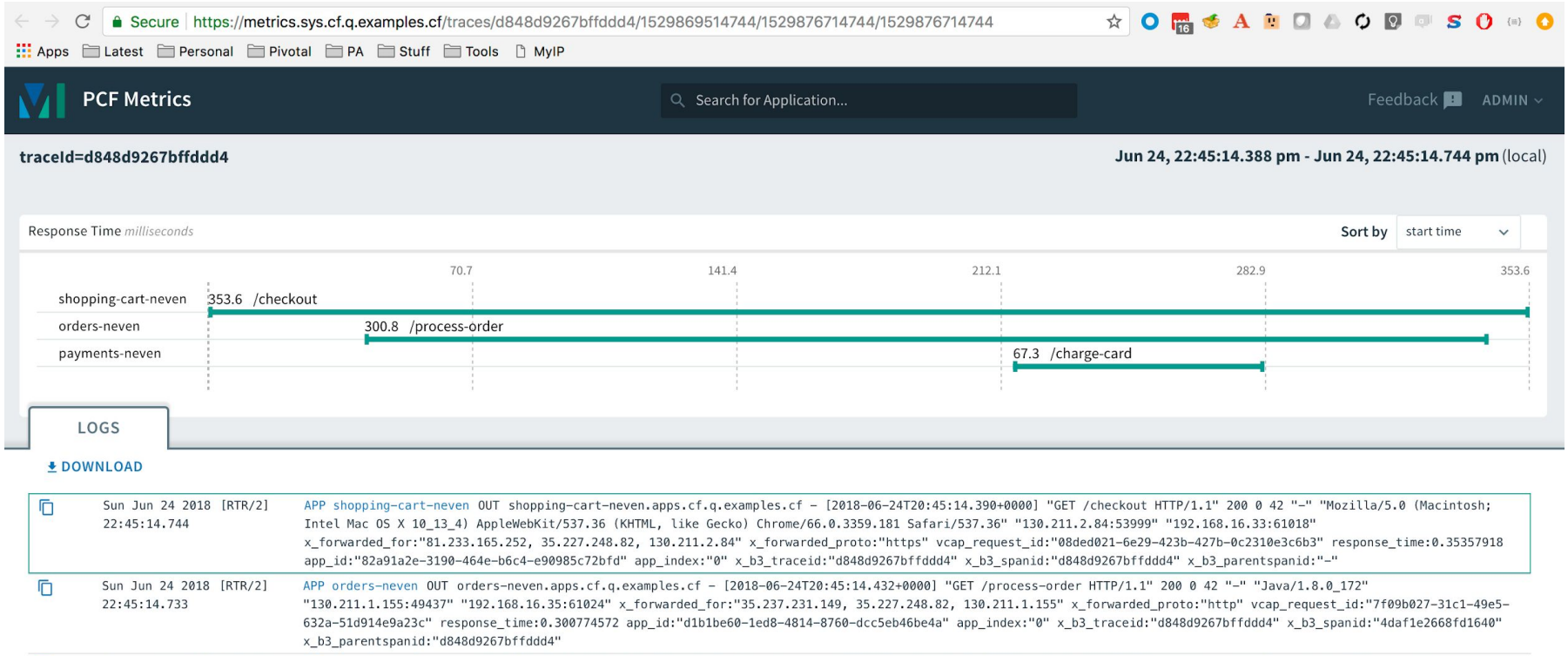
Distributed Tracing

- **Distributed Tracing** is a process of collecting end-to-end transaction graphs in near real time
- A **trace** represents the entire journey of a request
- A **span** represents single operation call
- Distributed Tracing systems are often used for this purpose.
  Zipkin is an example
- **Tracers** add logic to create unique trace Id, span Id

Visualization - Traces and Spans



PCF Metrics



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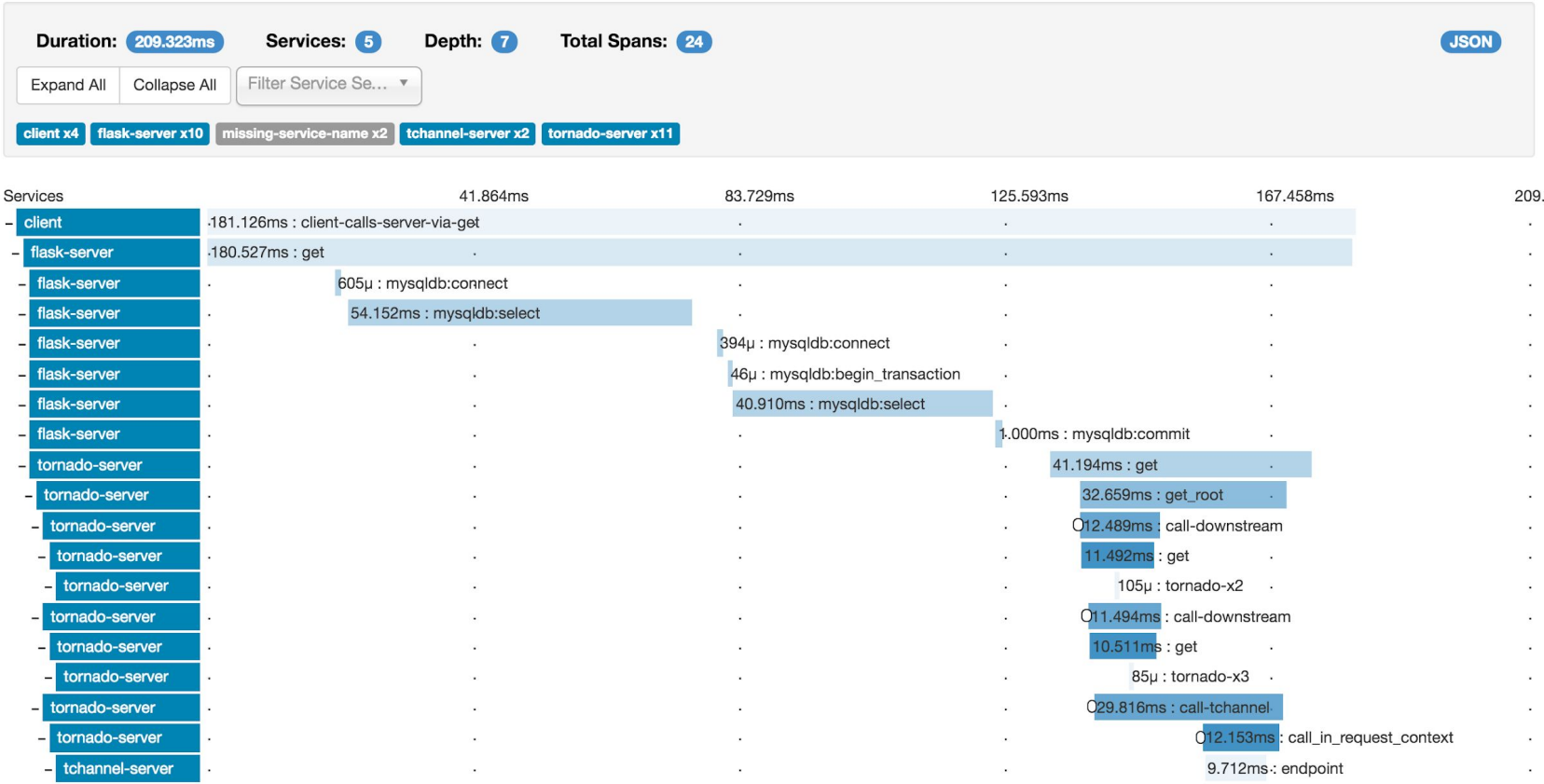
zipkin.io



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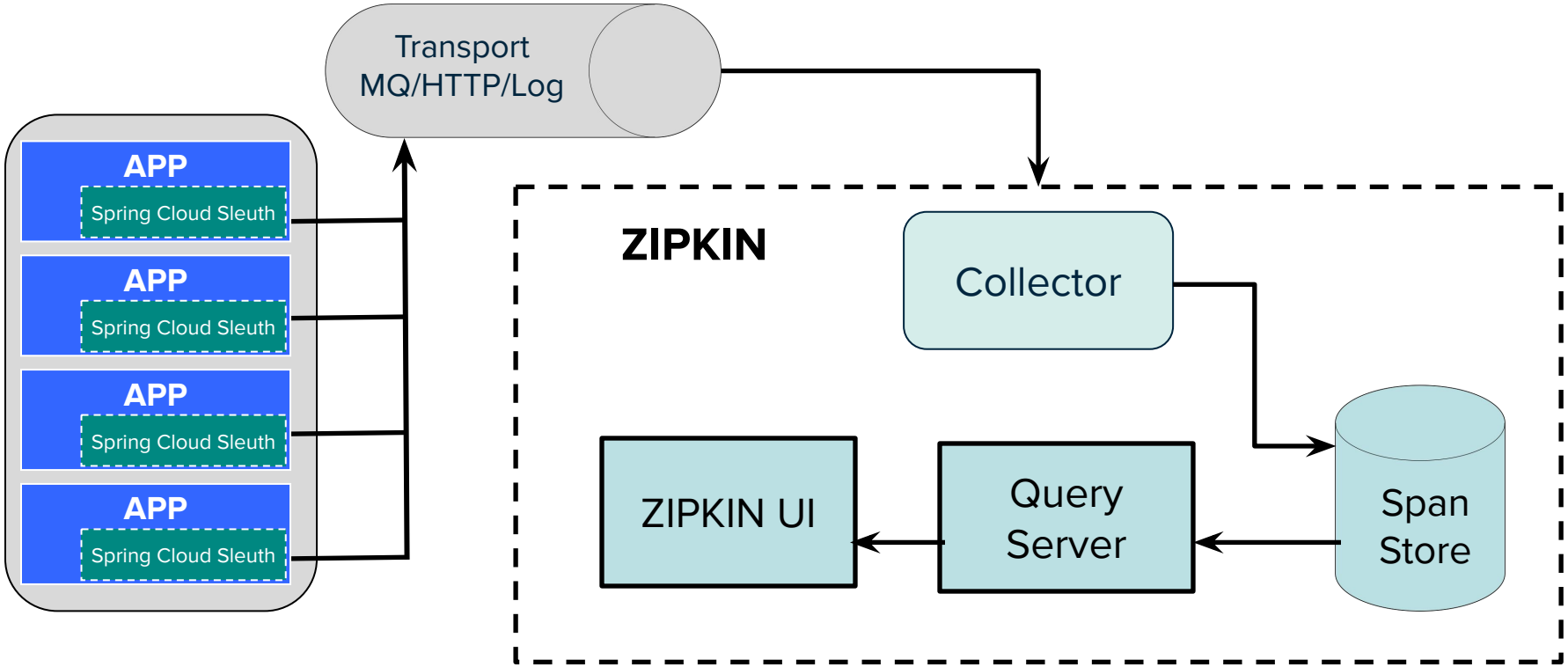
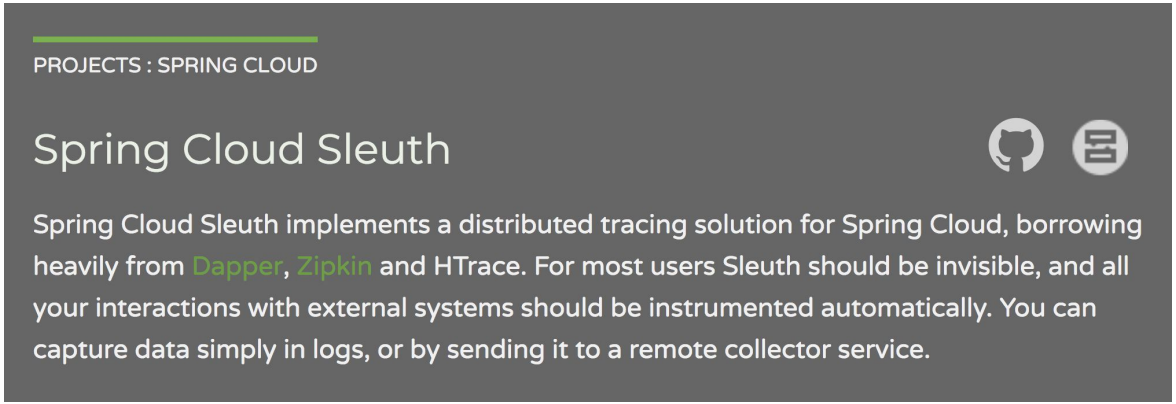
Integrate distributed tracing to your apps

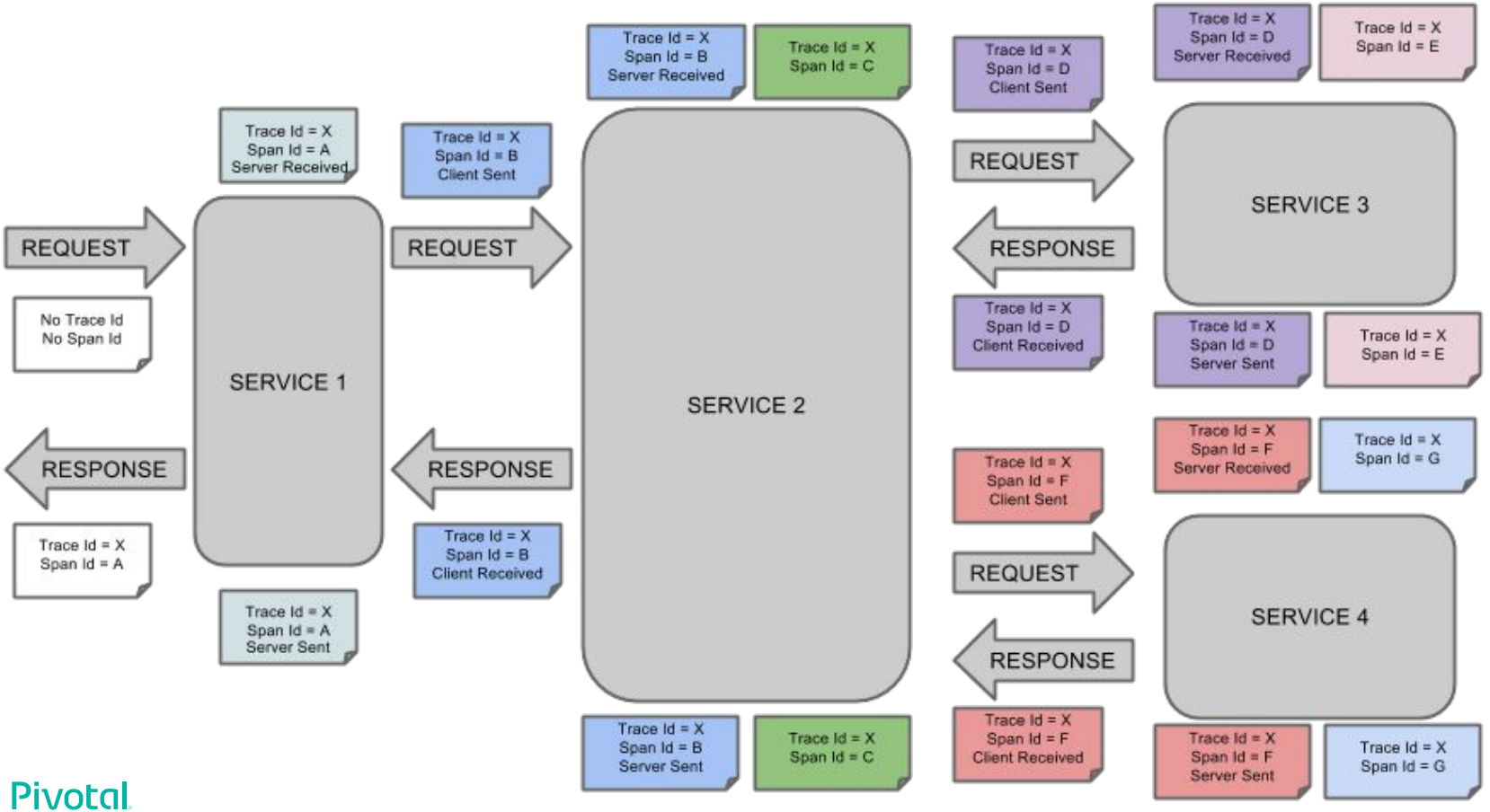


Spring Cloud Sleuth

https://github.com/practical-microservices/spring-cloud-sleuth-basics



Spring Cloud Sleuth



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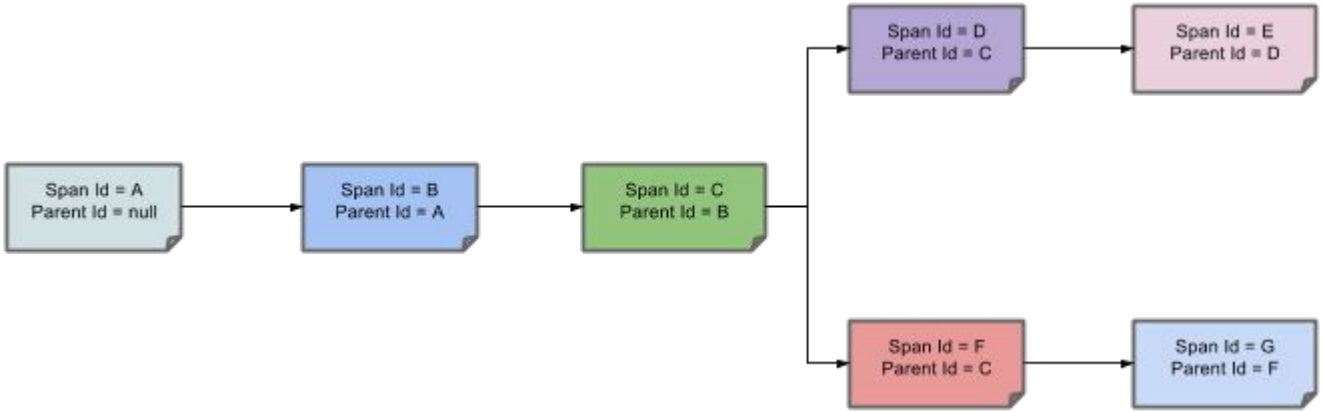
Tree built from trace data



Distributed Tracing

- Run `MessageService` in tracing/message-service project
- Run `BillboardClientApplication` in tracing/billboard-client project
- Open a terminal
  - cd into `tools/zipkin`
  - Run `java -jar zipkin-server-2.19.3-exec.jar`
  - Visit localhost:9411
- Visit localhost:8080 wait for the quotes to start loading
- Go back to zipkin ui
  - Search for traces to find a trace
  - Inspect the trace details
  - Show the dependency map

Observability

Metrics

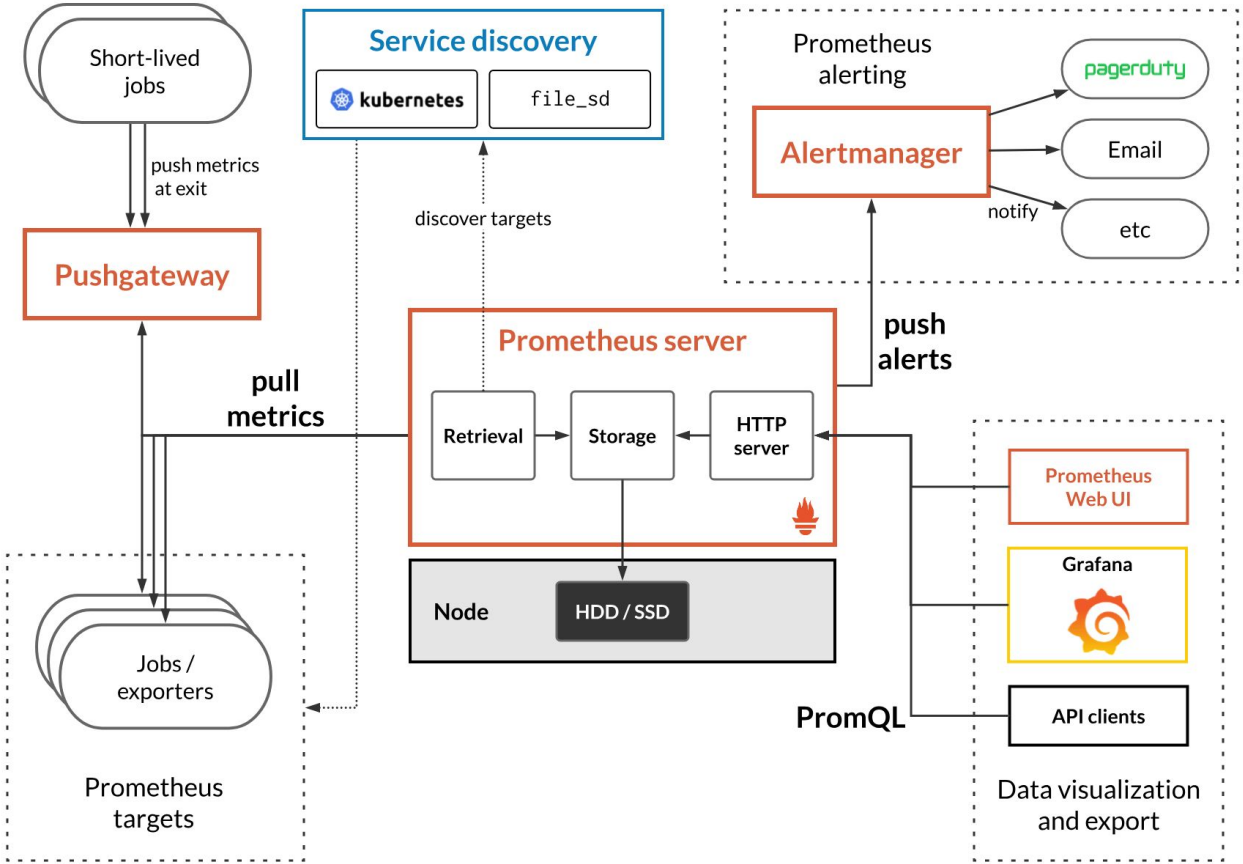
The Problem Context

- How can a microservice expose metrics on its internal state?
- How can metrics be tagged to make analysis and dashboarding easy?
- How can metrics be made to follow the conventions of the monitoring system used to store the metrics?
- How can metrics be altered on?

Common Metric Types

- **Counter** - always going up forever until resent back to 0
- **Gauge** - current value of a measure that range over a min and a max
- **Timer** - measures how long something took
- **Event Distributions & Histograms**

prometheus.io



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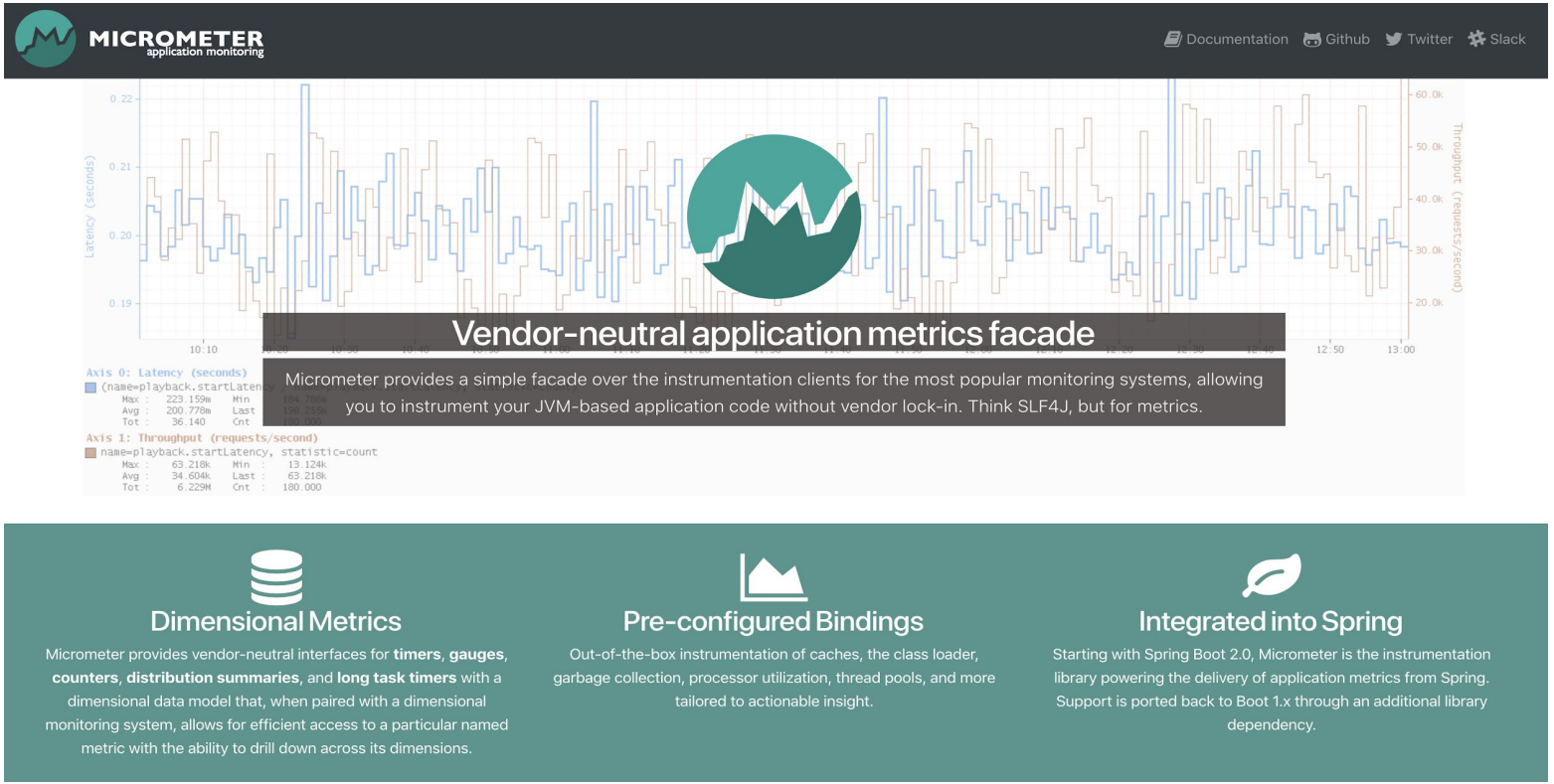
Micrometer.io



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Metrics

- Launch Prometheus
  - Open a command shell
  - cd into tools/<YourOS>/prometheus
  - Run the prometheus binary
  - Visit localhost:9090
- Launch Sample Application
  - Run `MetricsApplication` in metrics project
  - Visit localhost:8080 a to generate some random metrics
  - Visit localhost:8080/actuator/prometheus to view the the prometheus metris emitted by the application via micrometer
- Go back the Prometheu UI and check for metrics that the app is emitting you might need to generate some more data to get values that can be graphed.
- Examine the code in metrics application

Transforming How The World Builds Software