ADDO

ALL DAY DEVOPS

NOVEMBER 6, 2019

Mickey Boxell

The Open Source Observability Toolkit

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The Open Source Observability Toolkit

Mickey Boxell – Oracle Cloud Native Labs

Who am I?

Mickey Boxell

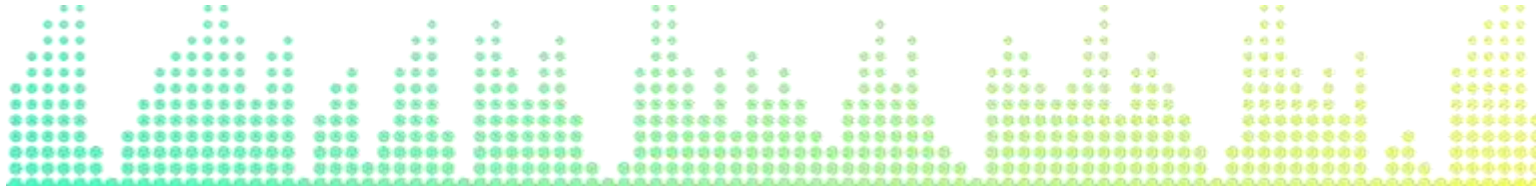
Product Manager, Cloud Advocate, etc.

Oracle Cloud Native Labs

Share best practices and build original solutions and content for cloud developers with a key focus on cloud native/container native, open source, and DevOps

Agenda

- What is observability and why should you care?
- Observability and monitoring tools
- Example troubleshooting flow



What is observability and why should you care?

Context: An Era of Microservices

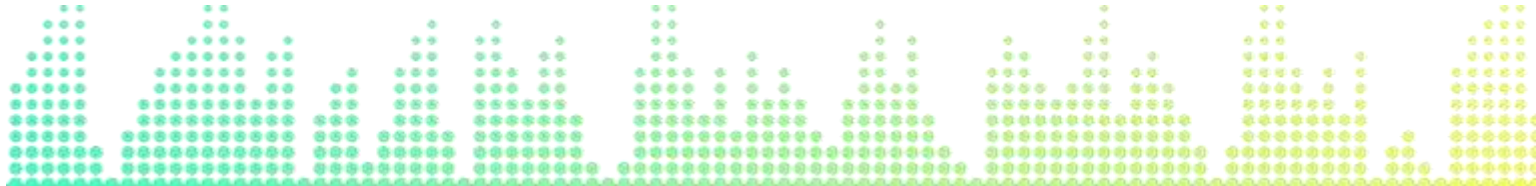
- Distributed
- Container-based
- Polyglot
- Scalable
- Ephemeral

Context: New Challenges

- Latency
- Integration testing
- Pinpointing issues
- Root cause analysis

Troubleshooting/Debugging and Root Cause Analysis

- Goal: address threats to customer satisfaction
- Debug novel problems in production
- There needs to be data to explore
- Quantitative analysis can help you make the business case to address an issue
- Retrospectives instill confidence that issues won’t happen again



Observability

- Designing and operating a more visible system
- Systems that can explain themselves without the need to deploy new code
- Understanding relationships between parts of your environment
- Explain variance between good and bad events

Observability

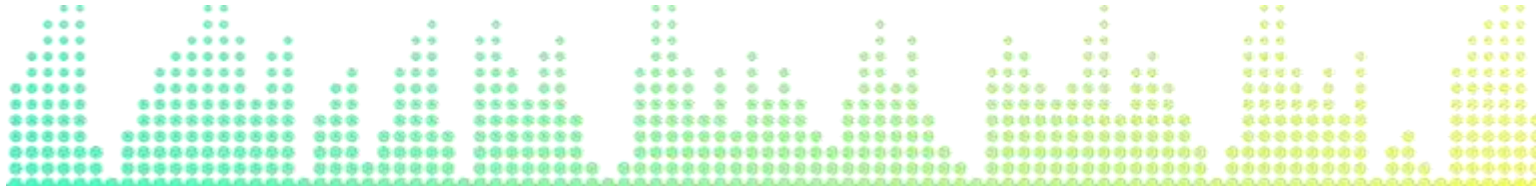
- Systems experience failure – be prepared
- Can you test your system in a realistic way?
- Can you monitor external outputs?
- Have you considered the business impact?
- Have you enabled cross-team collaboration?
- Have you developed a blameless culture?

Monitoring - External outputs

- Logs: a record of an event that took place at a given time
- Metrics: numeric aggregation of data describing behavior of a component or service measured over time
- Traces: capturing a request flow of causally-related events in a distributed environment

"Monitoring tells you whether a system is working, observability lets you ask why it isn't working"

- Baron Schwartz, CEO VividCortex



The Site Reliability Engineering Approach

- Site Reliability Engineering (SRE): reliably operating systems and infrastructure at scale
- Define metrics that matter most to the business, ideal values for those metrics, and the planned reaction if values aren't met
- Resources: Site Reliability Engineering and The Site Reliability Workbook

The Site Reliability Engineering Approach

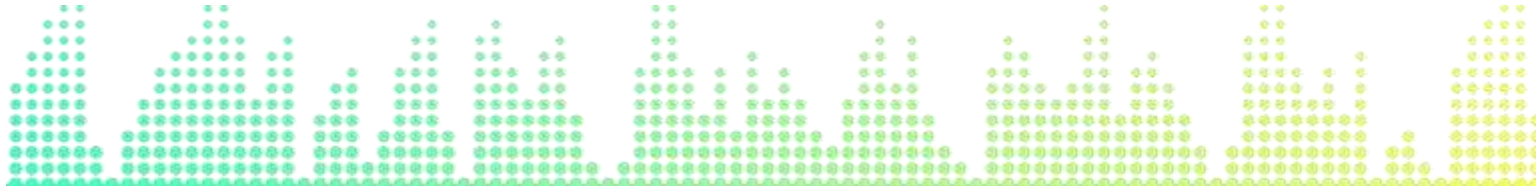
- Service level indicators (SLIs), Service level objectives (SLOs), Service level agreements (SLAs)
- RED (Request **R**ate, **E**rrors, and **D**uration)
- Increase mean time to failure (MTTF) decrease mean time to repair (MTTR)

Service Level Objectives

- No SLO < Good SLO < Perfect SLO
- Pick an objective and iterate
- What thresholds can we use? HTTP 200 + <300µ latency = good?
- Capture a set of events and use a window and target percentage 99.9% of events good in the last 30 days

Service Level Objectives

- A good SLO barely keeps users happy
- Think of events in context: is the user experience good or bad?
- Determine an error budget: allowance of failure - the trade off is not allowing for progress and innovation



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Observability and Monitoring Tools

Logging

Logs: a record of an event that took place at a given time

- Supported by most libraries
- Disciplined to put meaningful logs into your code
- Aggregate logs to avoid losing them
- Java logging classes and a logging.properties configuration file writing to stdout

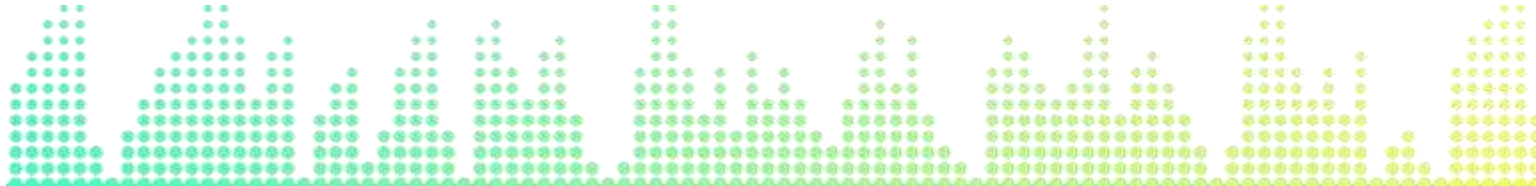
Logging

- **Fluentd** used to scrape, process, and ship logs
- Stored in a persistent data store, such as **Elasticsearch**, a distributed analytics engine
- Queried directly or interacted with by means of **Kibana**, a customizable visualization dashboard
- Choose a tool to capture and analyze logs

Metrics

Metrics: numeric aggregation of data describing behavior of a component or service measured over time

- Easy to store and model
- Useful to understand typical system behavior
- Supported by most libraries
- Java metrics classes that push data to a /metrics endpoint



Metrics

- **Prometheus**: open source systems monitoring toolkit
  - Scrape data and send it to the Prometheus time-series database
  - A query language to analyze the data
- **Grafana**: an open source data visualization tool for monitoring
  - Aggregate key metric data from numerous sources

Metrics

- **Oracle Cloud Monitoring Service** offers out of the box aggregated metrics for Oracle Cloud Infrastructure resources
- Metrics are available on the Oracle Cloud Console and via API
- We worked with Grafana to expose the Monitoring service as a Grafana data source

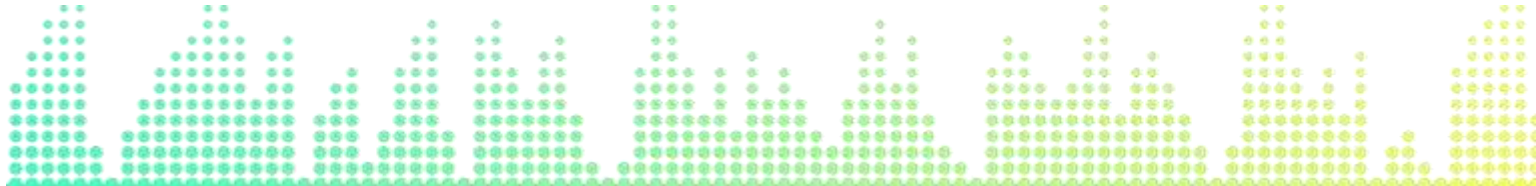
Metrics - Alerting

- Alerts: notifications indicating a human needs to take action
- Metrics are well-suited to trigger alerts
- Grafana can be used to trigger an alert when particular conditions are met

Tracing

Tracing: capturing a request flow of causally-related events

- Each has a request a global ID - metadata inserted at each step in the flow (a span) as the ID is passed along
- Distributed tracing systems like **Jaeger** or **Zipkin** are used to visualize + inspect traces
- OpenTelemetry: a language-neutral approach to tracing



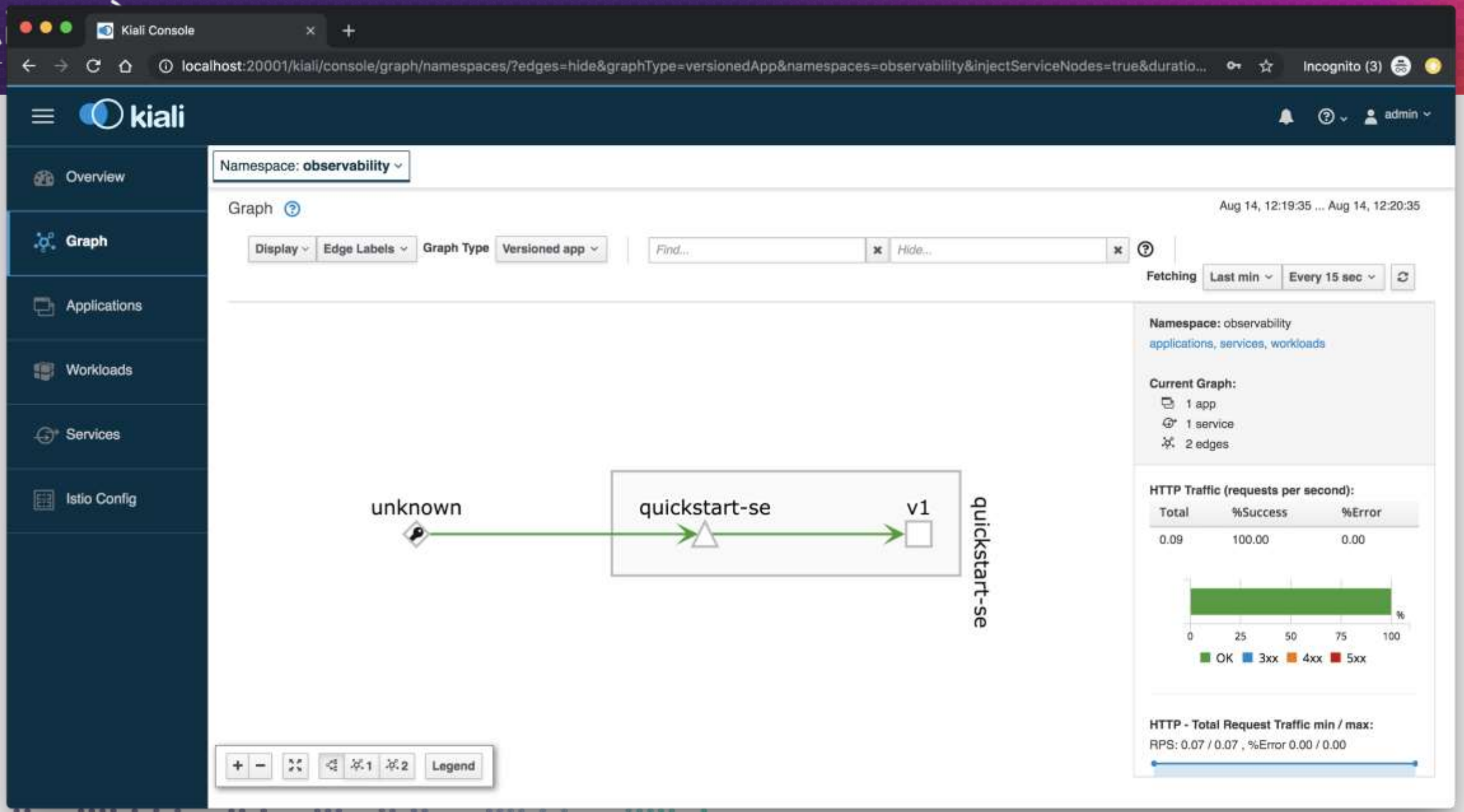
Service Mesh

Service Mesh : configurable infrastructure layer for microservice applications used to control east-west service traffic

- Monitor and control the flow of traffic through your cluster: canary, blue-green, failure injection, etc.
- Sidecar pattern or node agent/DaemonSet pattern

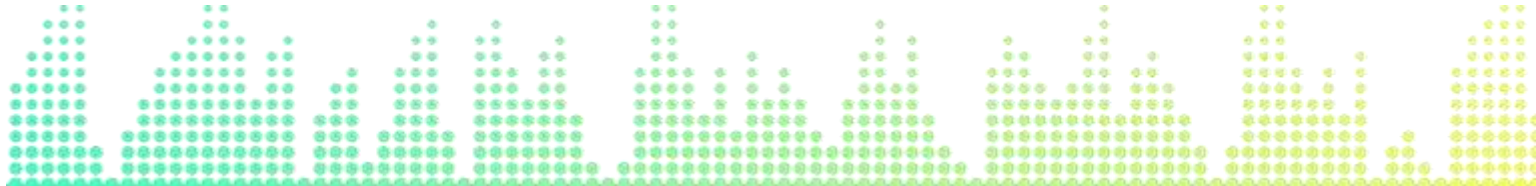
Service Mesh

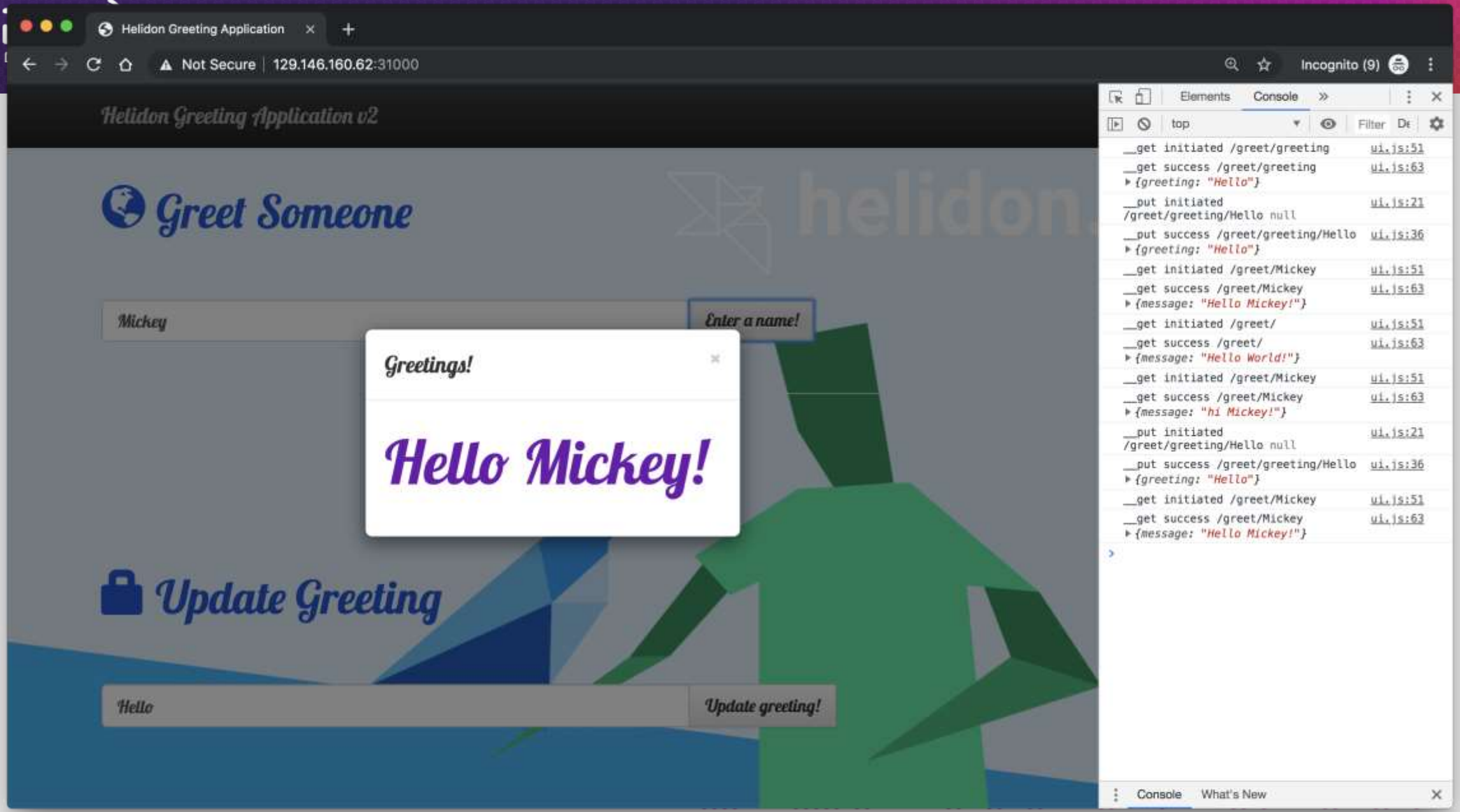
- Logging and metrics collection for free, simplified tracing
- Integration with open source observability tools: Grafana, Prometheus, Jaeger, and Kiali - prepopulated with dashboards
- **Kiali**: an observability tool for Istio that helps you visualize the relationships between services running in the mesh


Kiali Console
localhost:20001/kiali/console/graph/namespaces/?edges=hide&graphType=versionedApp&namespaces=observability&injectServiceNodes=true&duratio...
Incognito (3)
kiali
admin
Overview
Graph
Applications
Workloads
Services
Istio Config
Namespace: observability
Graph
Aug 14, 12:19:35 ... Aug 14, 12:20:35
Display
Edge Labels
Graph Type
Versioned app
Find...
Hide...
Fetching
Last min
Every 15 sec
unknown
quickstart-se
v1
quickstart-se
Namespace: observability
applications, services, workloads
Current Graph:
1 app
1 service
2 edges
HTTP Traffic (requests per second):
Total
%Success
%Error
0.09
100.00
0.00
0
25
50
75
100
%
OK
3xx
4xx
5xx
HTTP - Total Request Traffic min / max:
RPS: 0.07 / 0.07 , %Error 0.00 / 0.00
Legend

Sample Application

- Built using the Helidon framework – Java libraries for microservice development
- Main.java and RESTful GreetService.java along with app.yaml
- Tracing, health, and metrics instrumented
- Deployed on Kubernetes with sidecar injection enabled

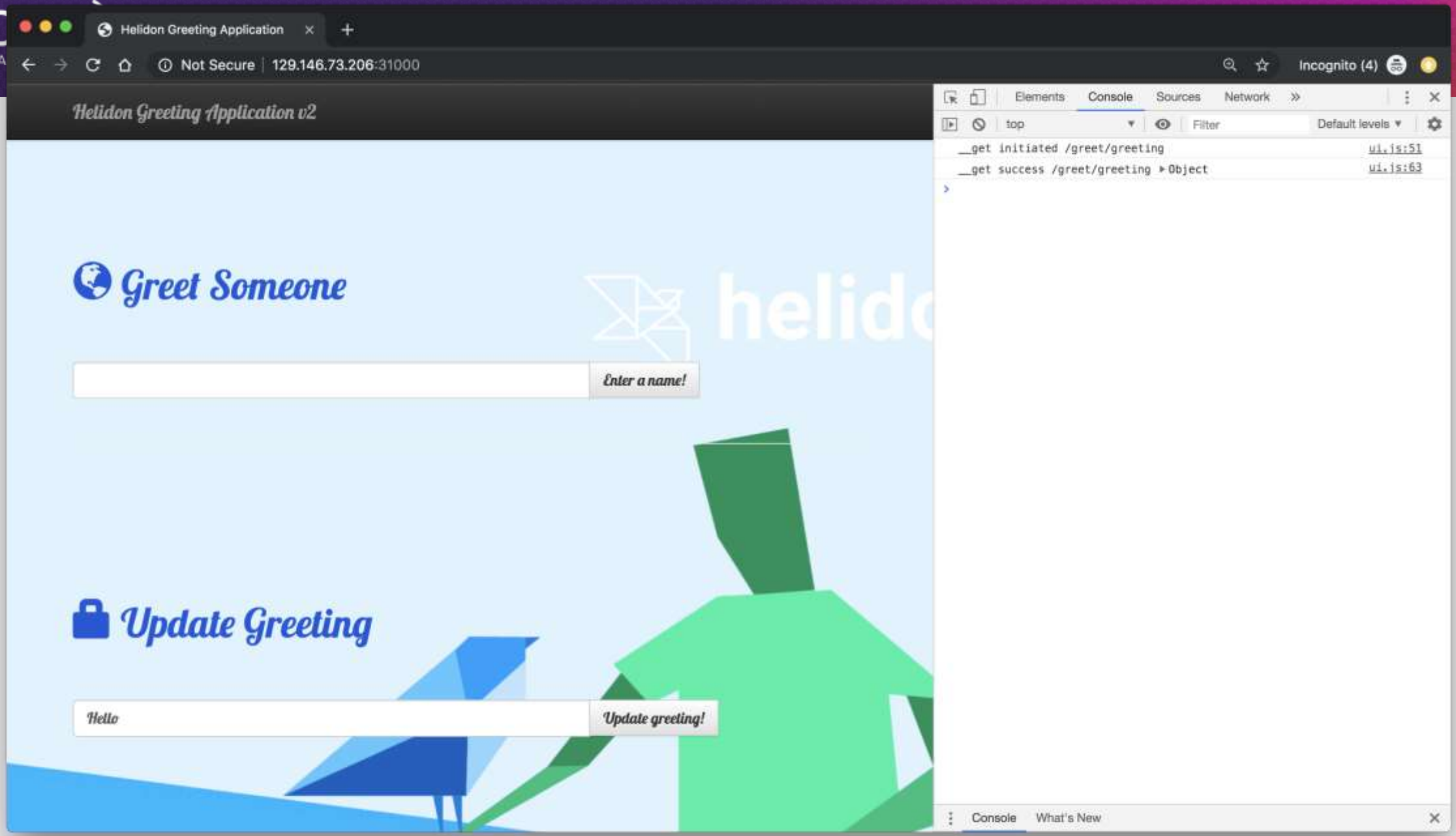


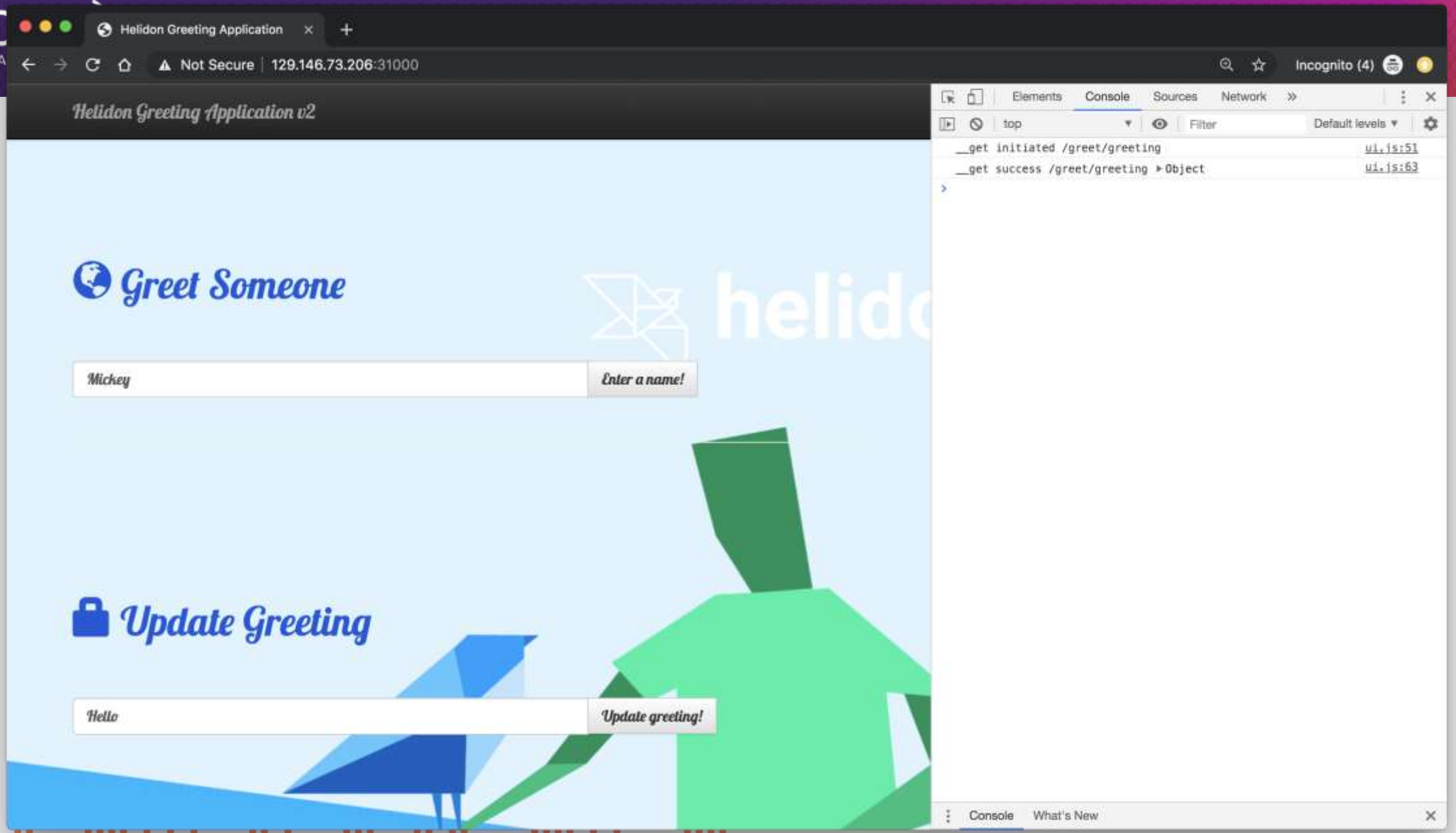

Helidon Greeting Application
Not Secure | 129.146.160.62:31000
Incognito (9)
Helidon Greeting Application v2
Greet Someone
Mickey
Enter a name!
Greetings!
Hello Mickey!
Update Greeting
Hello
Update greeting!
Elements
Console
top
Filter
__get initiated /greet/greeting ui.js:51
__get success /greet/greeting ui.js:63
{greeting: "Hello"}
__put initiated /greet/greeting/Hello null ui.js:21
__put success /greet/greeting/Hello ui.js:36
{greeting: "Hello"}
__get initiated /greet/Mickey ui.js:51
__get success /greet/Mickey ui.js:63
{message: "Hello Mickey!"}
__get initiated /greet/ ui.js:51
__get success /greet/ ui.js:63
{message: "Hello World!"}
__get initiated /greet/Mickey ui.js:51
__get success /greet/Mickey ui.js:63
{message: "hi Mickey!"}
__put initiated /greet/greeting/Hello null ui.js:21
__put success /greet/greeting/Hello ui.js:36
{greeting: "Hello"}
__get initiated /greet/Mickey ui.js:51
__get success /greet/Mickey ui.js:63
{message: "Hello Mickey!"}
Console
What's New

Example Troubleshooting Flow

Example Flow

- SLI tied to request duration – SLO is max 2 seconds/request
- Sample application instrumented for logging, metrics, and tracing
- Grafana, Prometheus, Jaeger, Istio, Kiali, Elasticsearch, FluentD, Kibana configured in my cluster
- Request duration alert rule in Grafana connected to Slack

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ui.js:63
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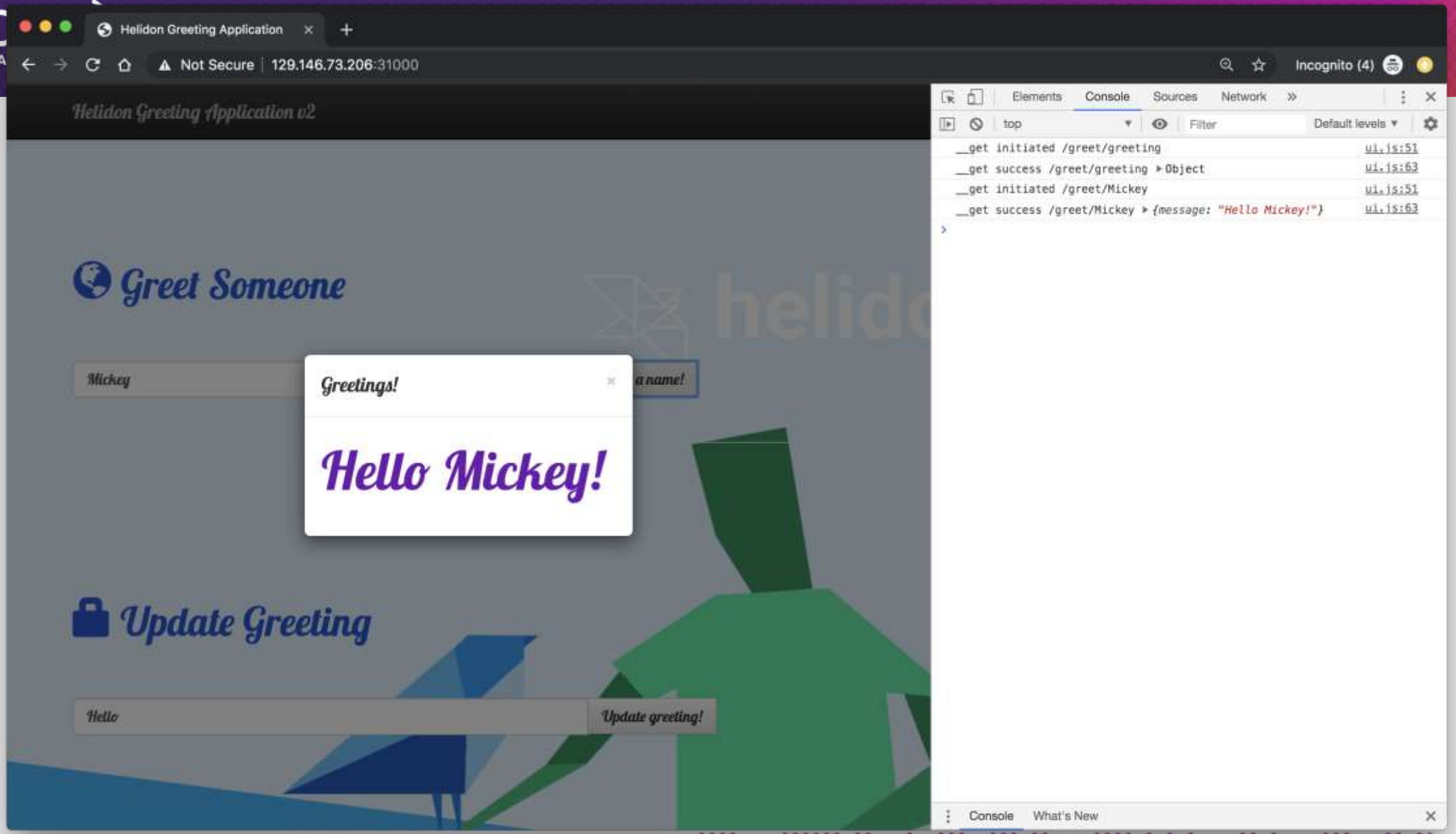
What's New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ui.js:51
__get success /greet/Mickey ▸{message: "Hello Mickey!"}
ui.js:63
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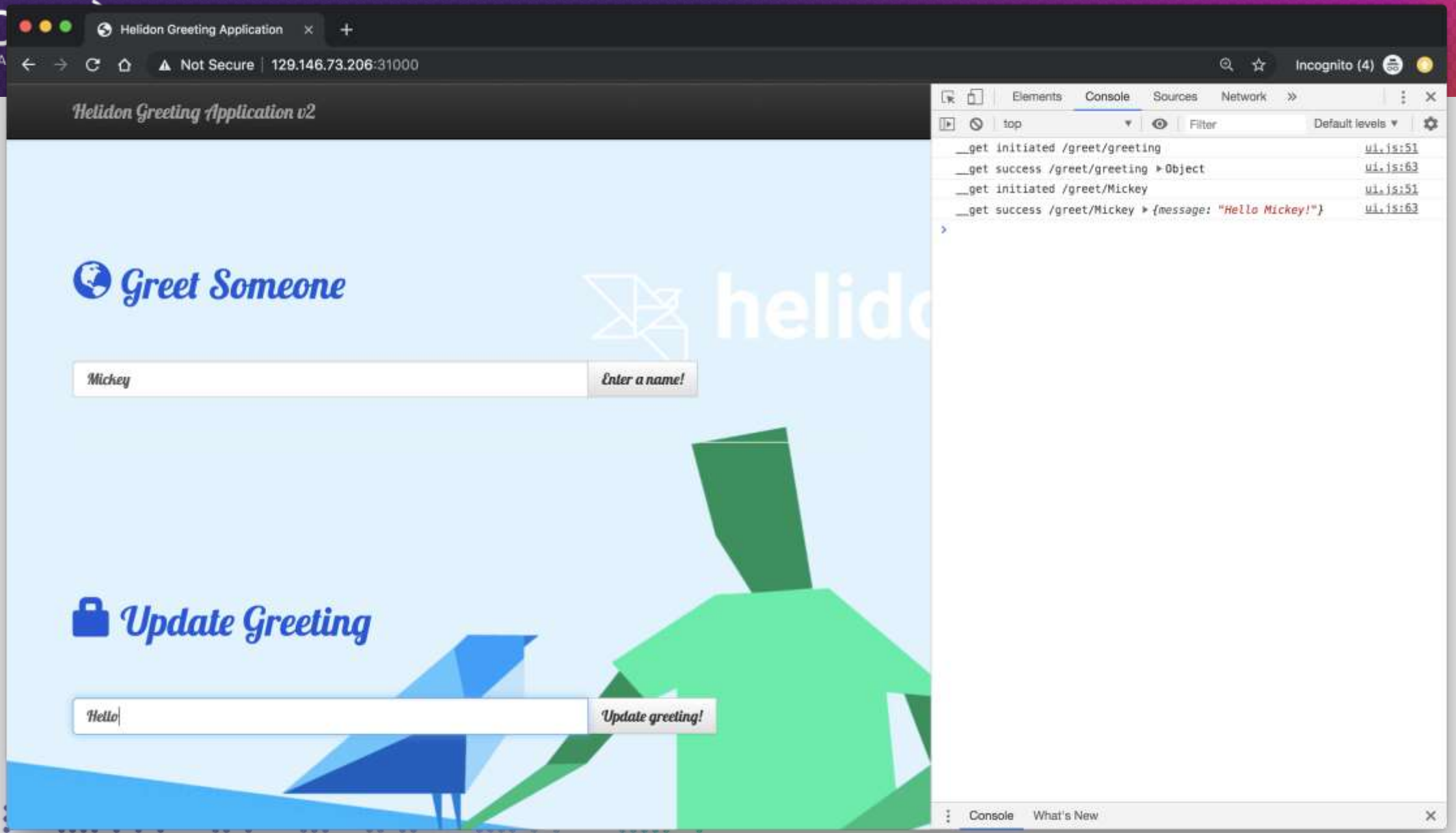
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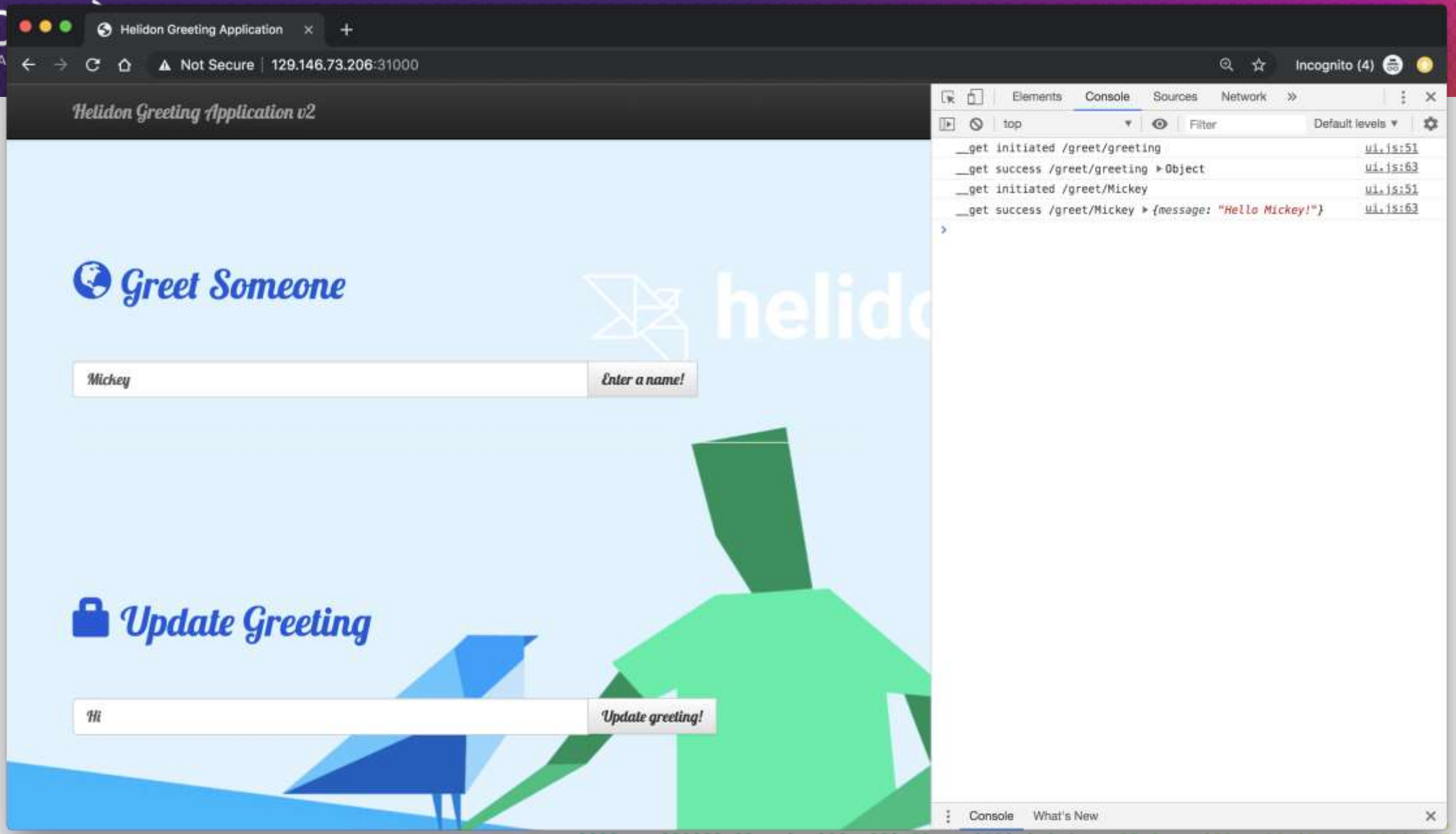
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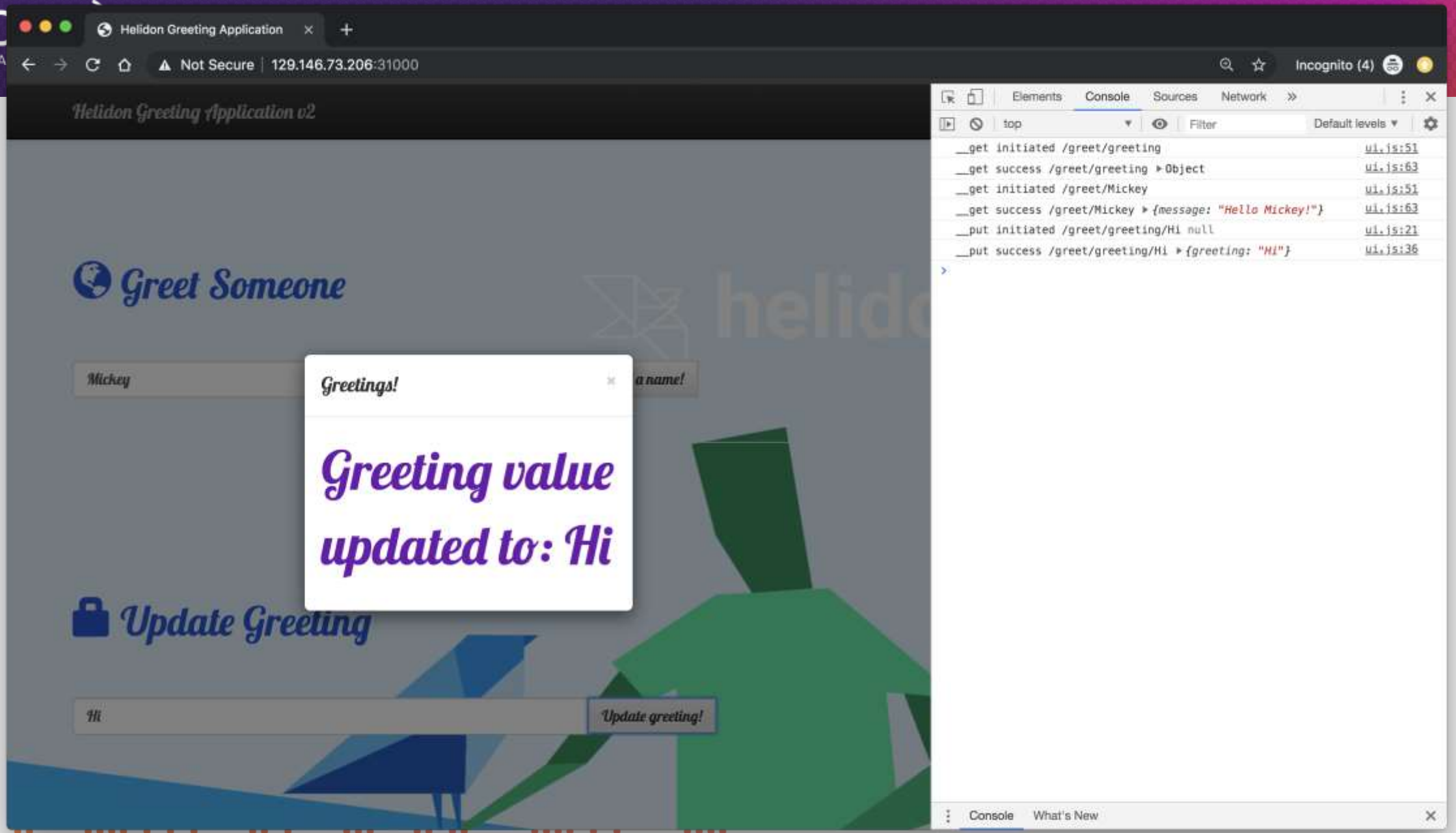
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Greet Someone
Mickey
a name!
Greetings!
Greeting value updated to: Hi
Update Greeting
Hi
Update greeting!
Elements
Console
Sources
Network
top
Filter
Default levels
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__get initiated /greet/Mickey ui.js:51
__get success /greet/Mickey ▸{message: "Hello Mickey!"} ui.js:63
__put initiated /greet/greeting/Hi null ui.js:21
__put success /greet/greeting/Hi ▸{greeting: "Hi"} ui.js:36
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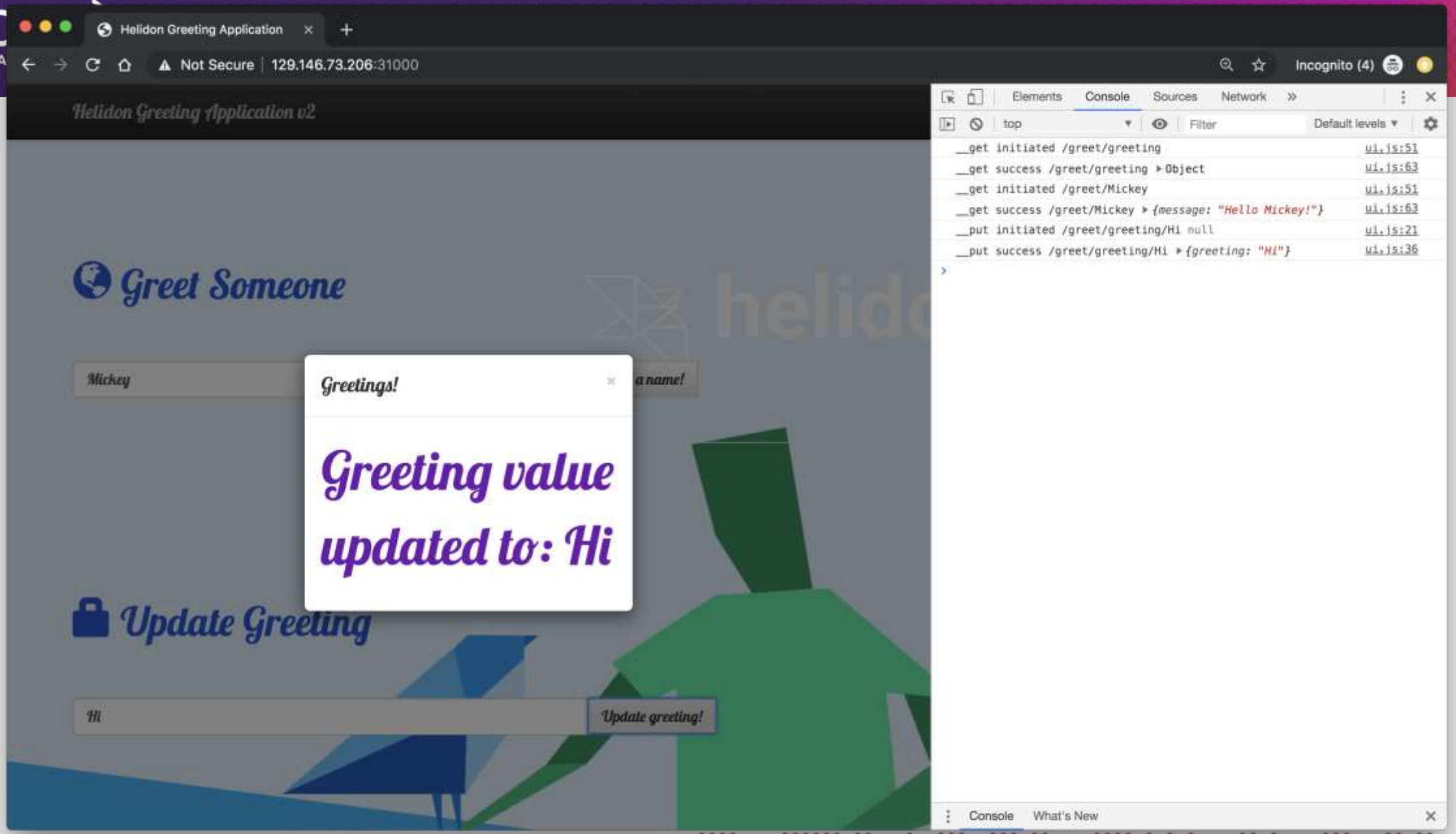
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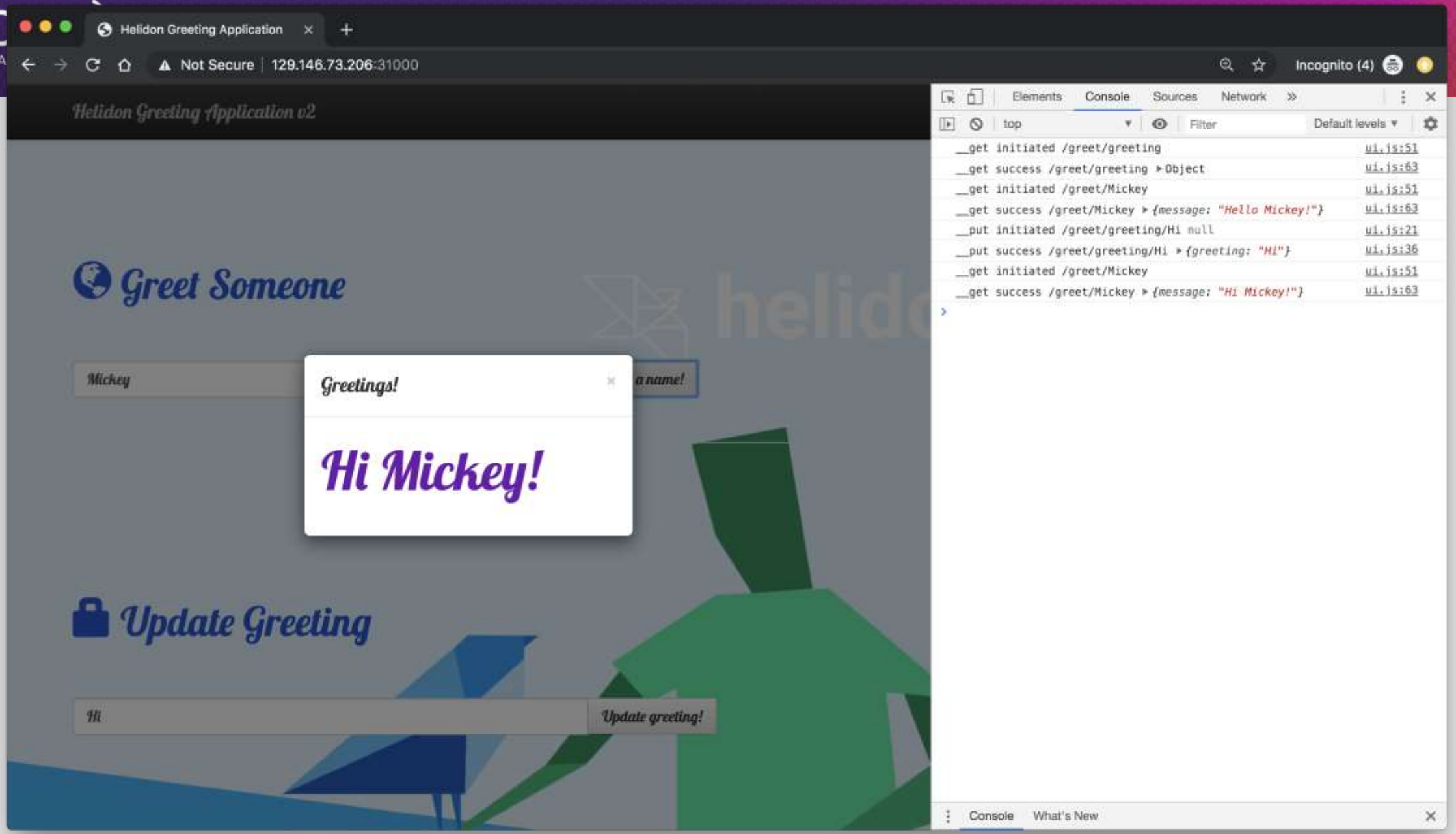
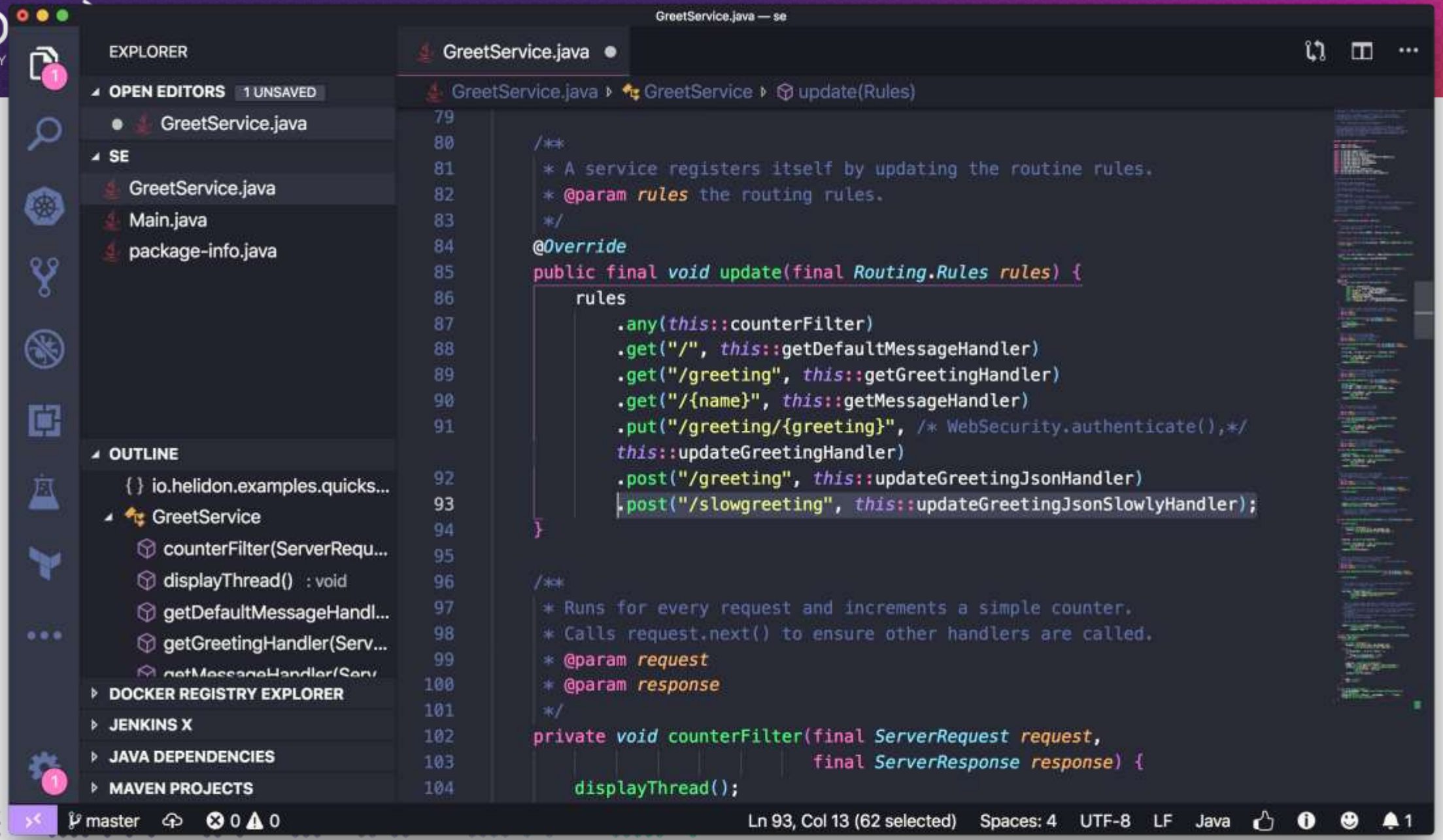
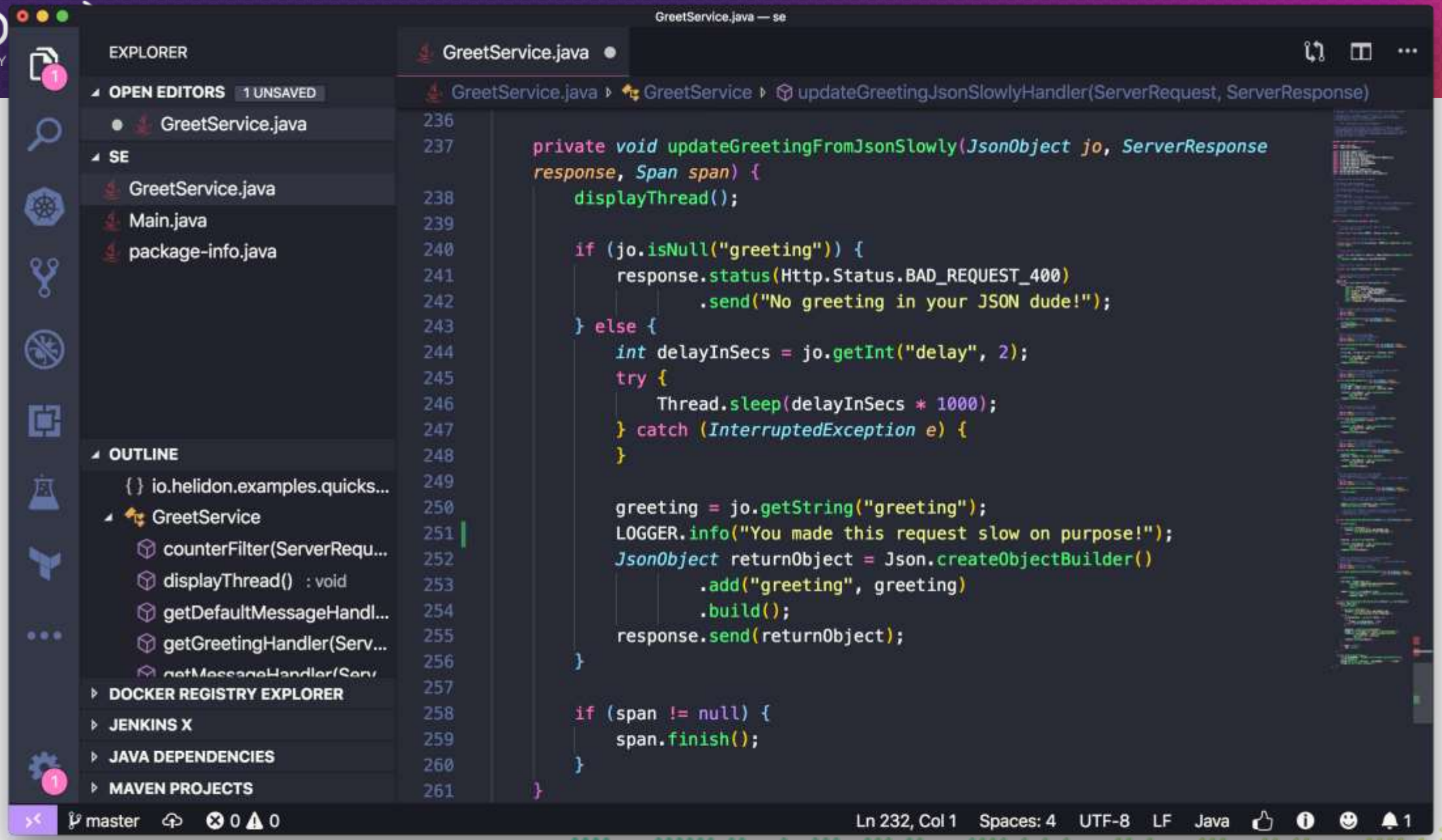



GreetService.java — se
EXPLORER
GreetService.java
OPEN EDITORS 1 UNSAVED
GreetService.java
SE
GreetService.java
Main.java
package-info.java
OUTLINE
{} io.helidon.examples.quicks...
GreetService
counterFilter(ServerRequ...
displayThread() : void
getDefaultMessageHandl...
getGreetingHandler(Serv...
DOCKER REGISTRY EXPLORER
JENKINS X
JAVA DEPENDENCIES
MAVEN PROJECTS
GreetService.java ▸ GreetService ▸ update(Rules)
79
80 /**
81 * A service registers itself by updating the routine rules.
82 * @param rules the routing rules.
83 */
84 @Override
85 public final void update(final Routing.Rules rules) {
86 rules
87 .any(this::counterFilter)
88 .get("/", this::getDefaultMessageHandler)
89 .get("/greeting", this::getGreetingHandler)
90 .get("/{name}", this::getMessageHandler)
91 .put("/greeting/{greeting}", /* WebSecurity.authenticate(),*/
this::updateGreetingHandler)
92 .post("/greeting", this::updateGreetingJsonHandler)
93 .post("/slowgreeting", this::updateGreetingJsonSlowlyHandler);
94 }
95
96 /**
97 * Runs for every request and increments a simple counter.
98 * Calls request.next() to ensure other handlers are called.
99 * @param request
100 * @param response
101 */
102 private void counterFilter(final ServerRequest request,
103 final ServerResponse response) {
104 displayThread();
master
0 0
Ln 93, Col 13 (62 selected)
Spaces: 4
UTF-8
LF
Java
1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GreetService.java
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GreetService.java
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GreetService
counterFilter(ServerRequ...
displayThread() : void
getDefaultMessageHandl...
getGreetingHandler(Serv...
DOCKER REGISTRY EXPLORER
JENKINS X
JAVA DEPENDENCIES
MAVEN PROJECTS
GreetService.java ▸ GreetService ▸ updateGreetingJsonSlowlyHandler(ServerRequest, ServerResponse)
236
237 private void updateGreetingFromJsonSlowly(JsonObject jo, ServerResponse
response, Span span) {
238 displayThread();
239
240 if (jo.isNull("greeting")) {
241 response.status(Http.Status.BAD_REQUEST_400)
242 .send("No greeting in your JSON dude!");
243 } else {
244 int delayInSecs = jo.getInt("delay", 2);
245 try {
246 Thread.sleep(delayInSecs * 1000);
247 } catch (InterruptedException e) {
248 }
249
250 greeting = jo.getString("greeting");
251 LOGGER.info("You made this request slow on purpose!");
252 JsonObject returnObject = Json.createObjectBuilder()
253 .add("greeting", greeting)
254 .build();
255 response.send(returnObject);
256 }
257
258 if (span != null) {
259 span.finish();
260 }
261 }
master
0 0
Ln 232, Col 1
Spaces: 4
UTF-8
LF
Java
1

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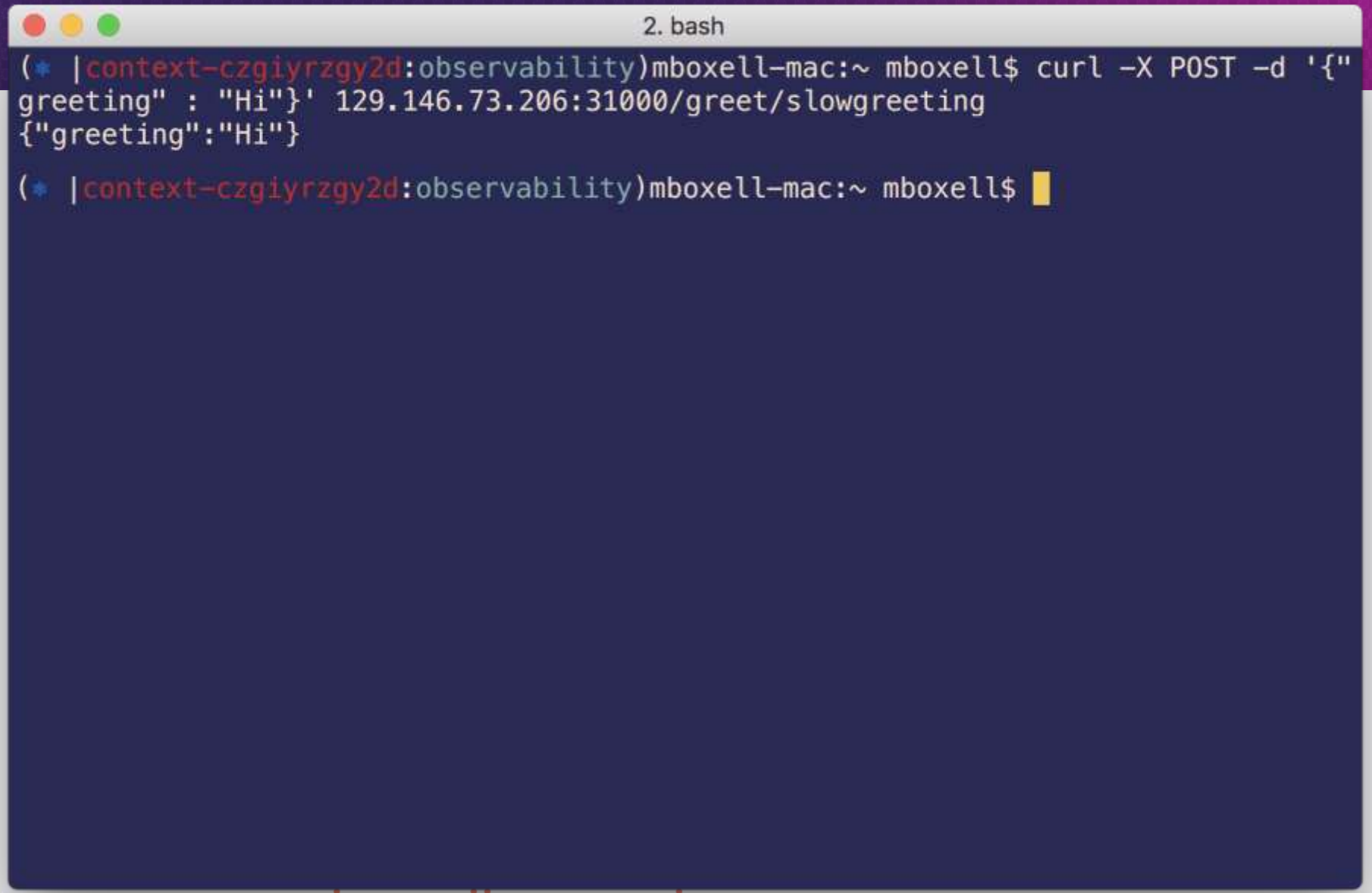
ALL DAY DEVOPS



grafana-alert-test | grafana-al

https://grafana-alertgroup.slack.com/messages/CHT4LQRSM/

Incognito (3)

grafana-alert

Mickey

Threads

Channels

everyone

grafana-alert-test

random

+ Add a channel

Direct Messages

Slackbot

Mickey (you)

+ **Invite people**

Apps

+ Install Google Drive

#grafana-alert-test

1 | 0 | Add a topic

Search

Yesterday

Grafana v6.1.0 | Yesterday at 12:06 PM

[OK] Request Duration alert

Grafana v6.1.0 | Yesterday at 12:06 PM

incoming-webhook APP 4:12 PM

[Alerting] Test notification

Someone is testing the alert notification within grafana.

High value	Higher Value
100	200

Error message

This is only a test

Grafana v6.0.0 | Yesterday at 4:12 PM (30 kB)

[Alerting] Request Duration alert

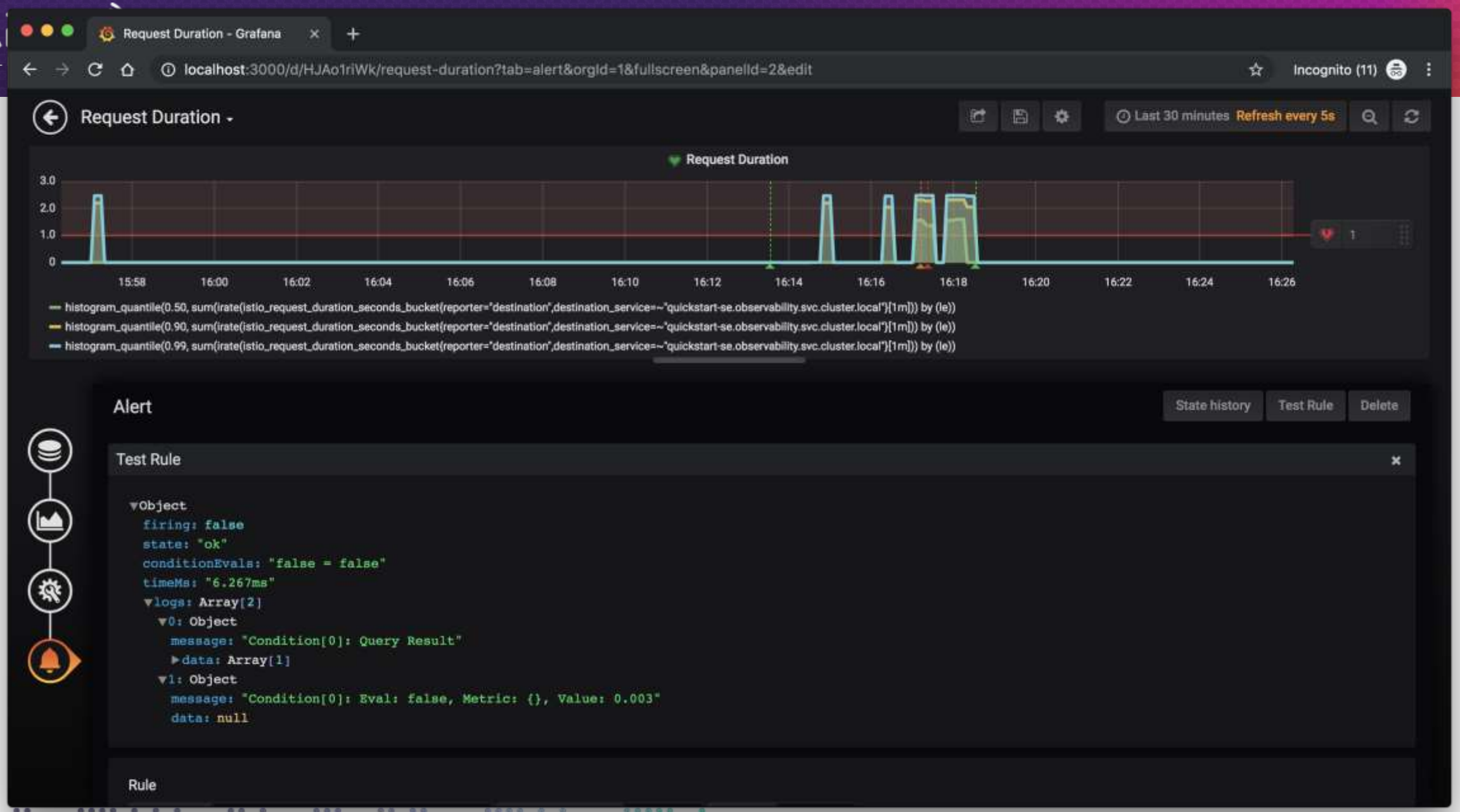
Please take a look at request duration times.

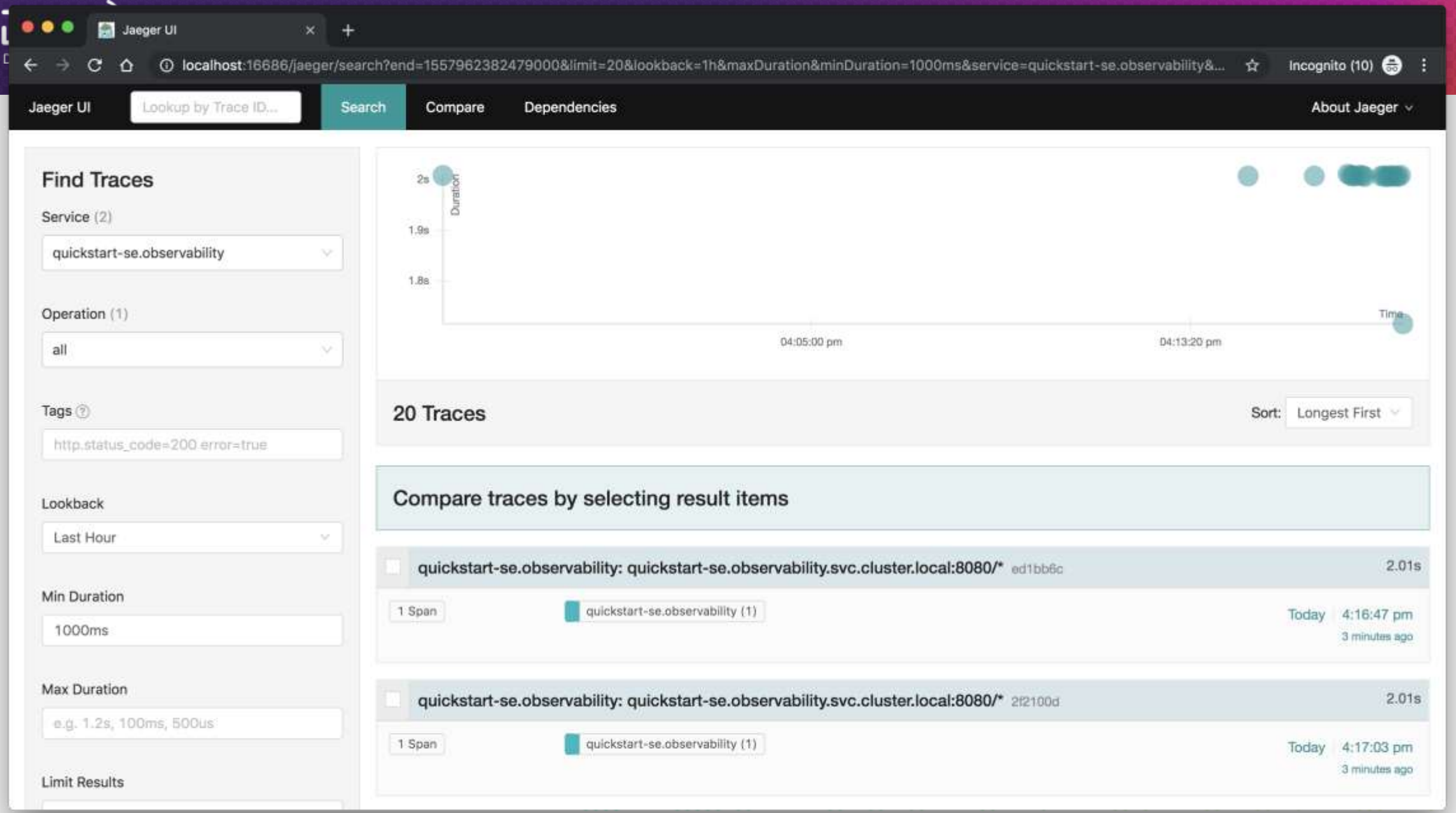
{}

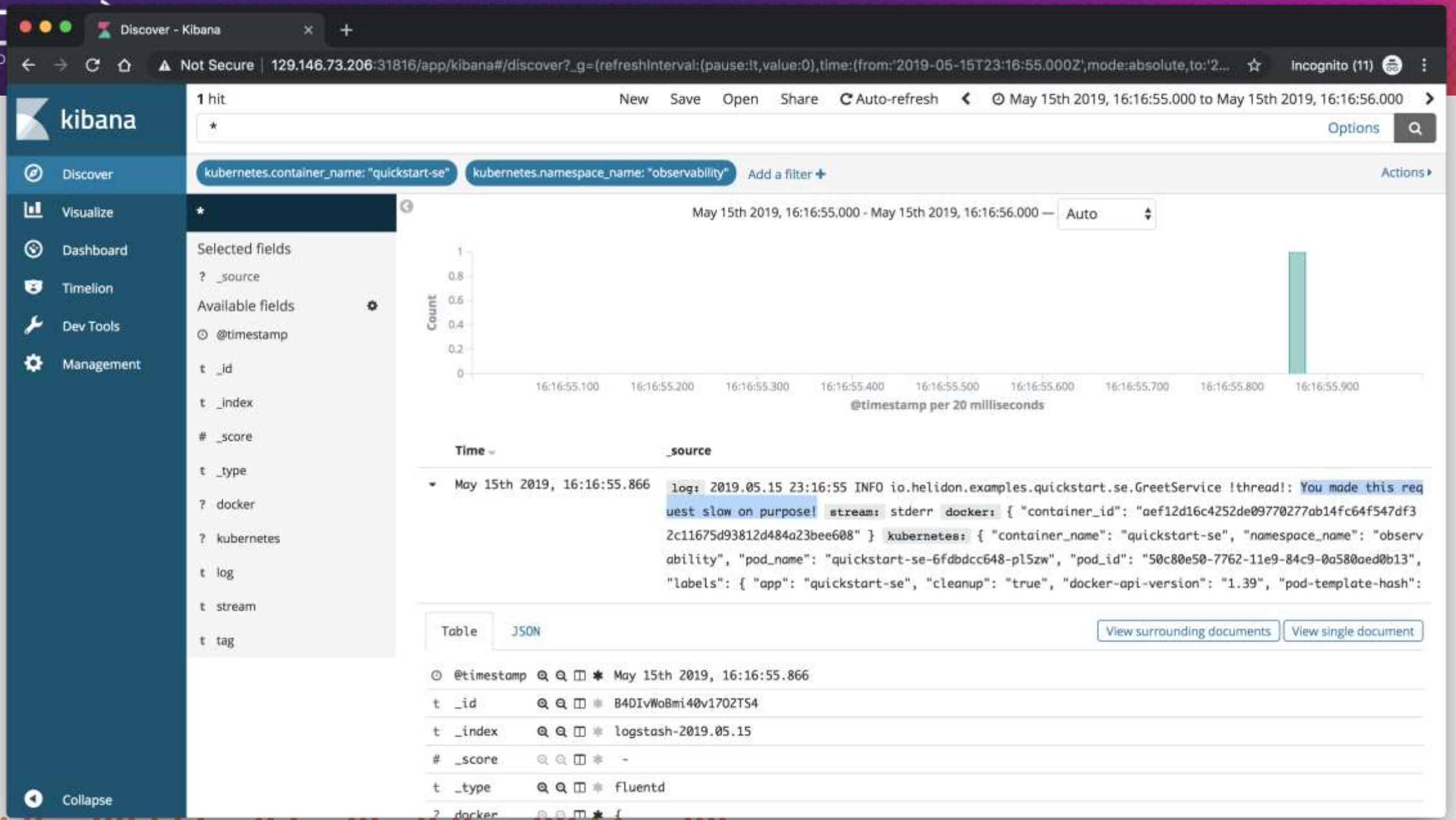
1.5

Grafana v6.0.0 | Yesterday at 4:17 PM

Message #grafana-alert-test


Request Duration - Grafana
localhost:3000/d/HJAo1riWk/request-duration?tab=alert&orgId=1&fullscreen&panelId=2&edit
Incognito (11)
Request Duration
Last 30 minutes
Refresh every 5s
Request Duration
3.0
2.0
1.0
0
15:58
16:00
16:02
16:04
16:06
16:08
16:10
16:12
16:14
16:16
16:18
16:20
16:22
16:24
16:26
histogram_quantile(0.50, sum(irate(istio_request_duration_seconds_bucket{reporter="destination",destination_service=~"quickstart-se.observability.svc.cluster.local"}[1m])) by (le))
histogram_quantile(0.90, sum(irate(istio_request_duration_seconds_bucket{reporter="destination",destination_service=~"quickstart-se.observability.svc.cluster.local"}[1m])) by (le))
histogram_quantile(0.99, sum(irate(istio_request_duration_seconds_bucket{reporter="destination",destination_service=~"quickstart-se.observability.svc.cluster.local"}[1m])) by (le))
Alert
State history
Test Rule
Delete
Test Rule
▼Object
firing: false
state: "ok"
conditionEvals: "false = false"
timeMs: "6.267ms"
▼logs: Array[2]
▼0: Object
message: "Condition[0]: Query Result"
▶data: Array[1]
▼1: Object
message: "Condition[0]: Eval: false, Metric: {}, Value: 0.003"
data: null
Rule


Jaeger UI
localhost:16686/jaeger/search?end=1557962382479000&limit=20&lookback=1h&maxDuration&minDuration=1000ms&service=quickstart-se.observability&...
Incognito (10)
Jaeger UI
Lookup by Trace ID...
Search
Compare
Dependencies
About Jaeger
Find Traces
Service (2)
quickstart-se.observability
Operation (1)
all
Tags
http.status_code=200 error=true
Lookback
Last Hour
Min Duration
1000ms
Max Duration
e.g. 1.2s, 100ms, 500us
Limit Results
2s
1.9s
1.8s
Duration
04:05:00 pm
04:13:20 pm
Time
20 Traces
Sort:
Longest First
Compare traces by selecting result items
quickstart-se.observability: quickstart-se.observability.svc.cluster.local:8080/* ed1bb6c
2.01s
1 Span
quickstart-se.observability (1)
Today
4:16:47 pm
3 minutes ago
quickstart-se.observability: quickstart-se.observability.svc.cluster.local:8080/* 2f2100d
2.01s
1 Span
quickstart-se.observability (1)
Today
4:17:03 pm
3 minutes ago


Discover - Kibana
Not Secure
129.146.73.206:31816/app/kibana#/discover?_g=(refreshInterval:(pause:!t,value:0),time:(from:'2019-05-15T23:16:55.000Z',mode:absolute,to:'2...
Incognito (11)
kibana
1 hit
New
Save
Open
Share
Auto-refresh
May 15th 2019, 16:16:55.000 to May 15th 2019, 16:16:56.000
*
Options
Discover
Visualize
Dashboard
Timelion
Dev Tools
Management
kubernetes.container_name: "quickstart-se"
kubernetes.namespace_name: "observability"
Add a filter +
Actions
Selected fields
? _source
Available fields
@timestamp
t _id
t _index
_score
t _type
? docker
? kubernetes
t log
t stream
t tag
May 15th 2019, 16:16:55.000 - May 15th 2019, 16:16:56.000 —
Auto
Count
1
0.8
0.6
0.4
0.2
0
16:16:55.100
16:16:55.200
16:16:55.300
16:16:55.400
16:16:55.500
16:16:55.600
16:16:55.700
16:16:55.800
16:16:55.900
@timestamp per 20 milliseconds
Time
_source
May 15th 2019, 16:16:55.866
log: 2019.05.15 23:16:55 INFO io.helidon.examples.quickstart.se.GreetService !thread!: You made this request slow on purpose! stream: stderr docker: { "container_id": "aef12d16c4252de09770277ab14fc64f547df32c11675d93812d484a23bee608" } kubernetes: { "container_name": "quickstart-se", "namespace_name": "observability", "pod_name": "quickstart-se-6fdbdcc648-pl5zw", "pod_id": "50c80e50-7762-11e9-84c9-0a580aed0b13", "labels": { "app": "quickstart-se", "cleanup": "true", "docker-api-version": "1.39", "pod-template-hash":
Table
JSON
View surrounding documents
View single document
@timestamp
May 15th 2019, 16:16:55.866
t _id
B4DIvWoBmi40v17O2TS4
t _index
logstash-2019.05.15
_score
-
t _type
fluentd
? docker
{
Collapse

grafana-alert-test | grafana-a | Request Duration - Grafana

https://grafana-alertgroup.slack.com/messages/CHT4LQRSM/

Incognito (10)

grafana-alert
Mickey

Threads

Channels
everyone
grafana-alert-test
random

+ Add a channel

Direct Messages
Slackbot
Mickey (you)

+ **Invite people**

Apps

+ Install Google Drive

#grafana-alert-test

1 | 0 | Add a topic

Search

Today

[OK] Request Duration alert
Grafana v6.1.0 | Today at 12:06 PM

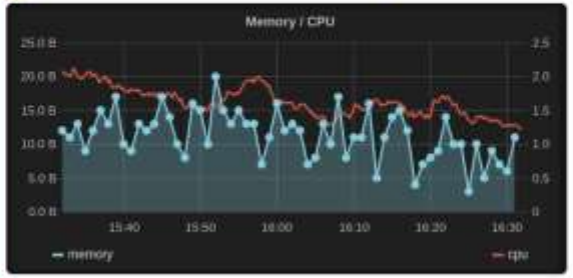
incoming-webhook APP 4:12 PM

[Alerting] Test notification
Someone is testing the alert notification within grafana.

High value	Higher Value
100	200

Error message
This is only a test

Grafana v6.0.0 | Today at 4:12 PM (30 kB)



[Alerting] Request Duration alert
Please take a look at request duration times.
{}
1.5
Grafana v6.0.0 | Today at 4:17 PM

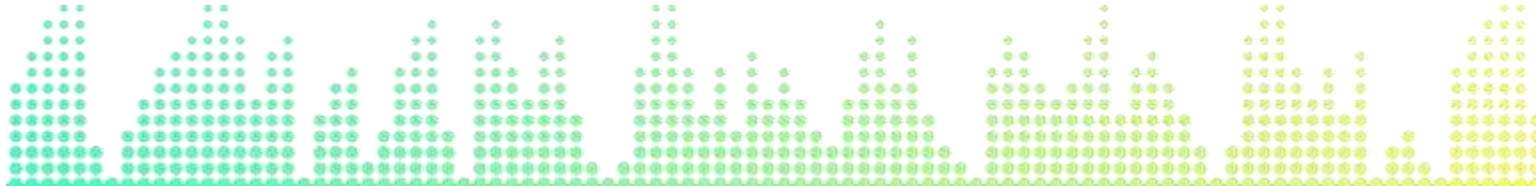
new messages

[OK] Request Duration alert
Grafana v6.0.0 | Today at 4:19 PM

Message #grafana-alert-test

Key Takeaways

- Gain insight from logging, metrics, and tracing - discover issues, pinpoint their location, and determine a fix
- Proactively test and improve system performance/efficiency
- Recognize the impact to the business



Key Takeaways

- Observability takes a holistic approach to operations
- Its practices give you maximum visibility into the behavior of a modern distributed system

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