





## [web-store] Shopist checkouts have a high number of fai...

Status: **TRIGGERED** Urgency: **HIGH** Triggered: May 15, 4:38 am Responder: Scott Gerring Service: web-store Tags: 5 tags

### NEXT STEPS

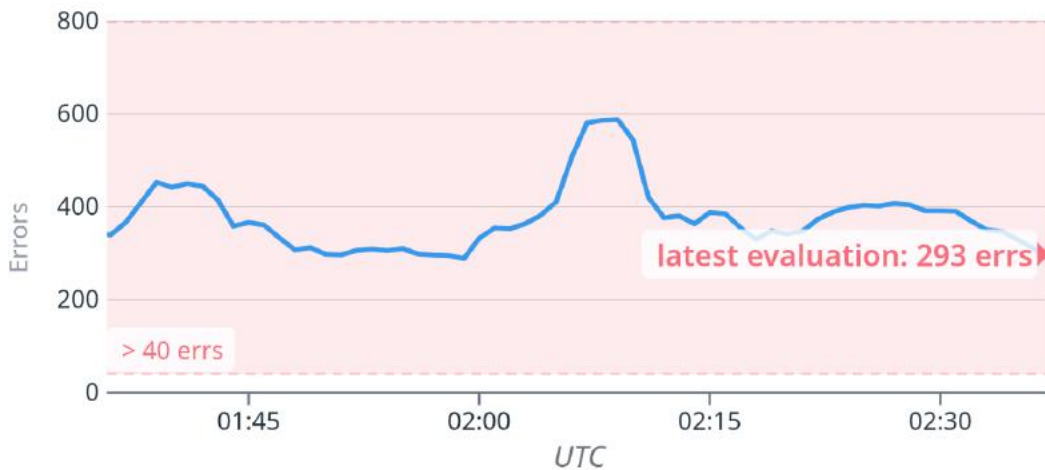
Acknowledge

✓ Resolve

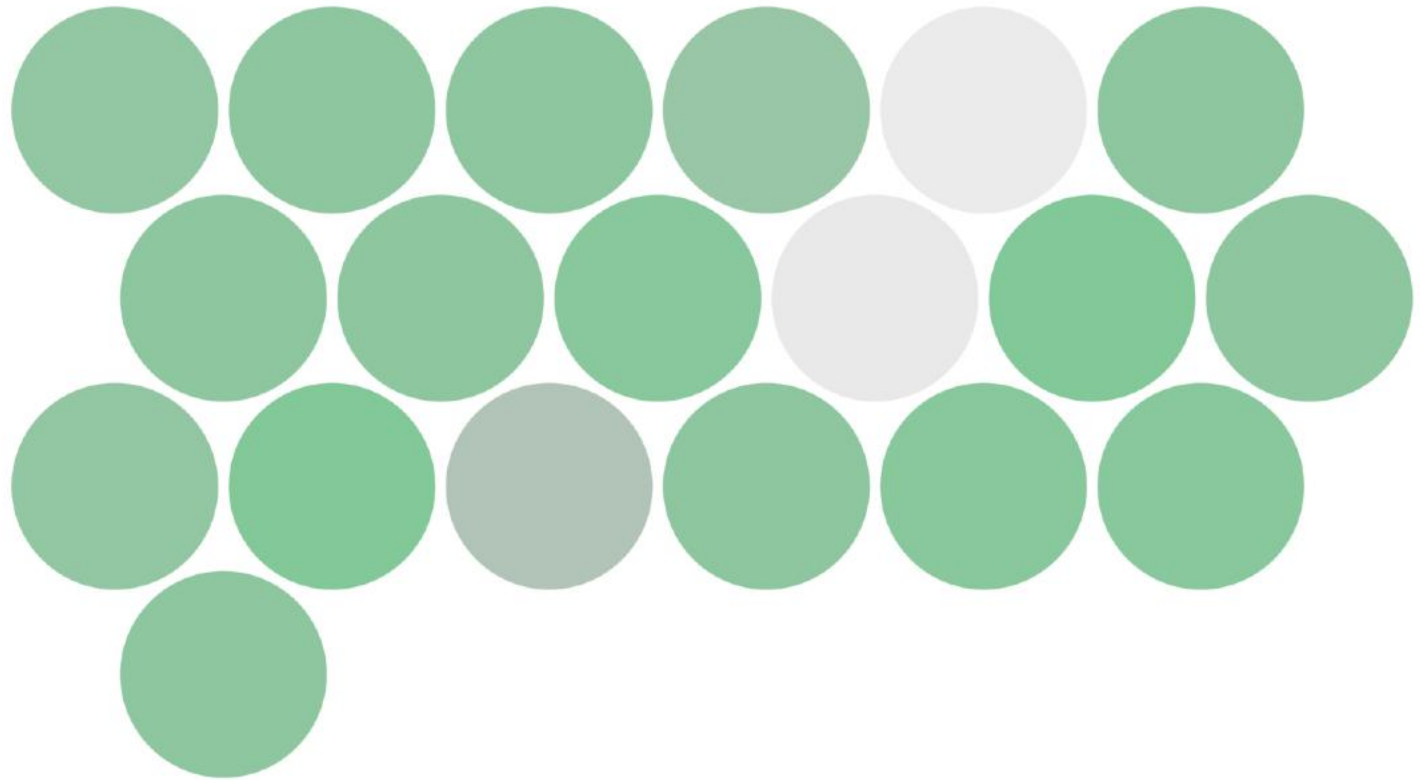
🔔 Declare Incident

### Description

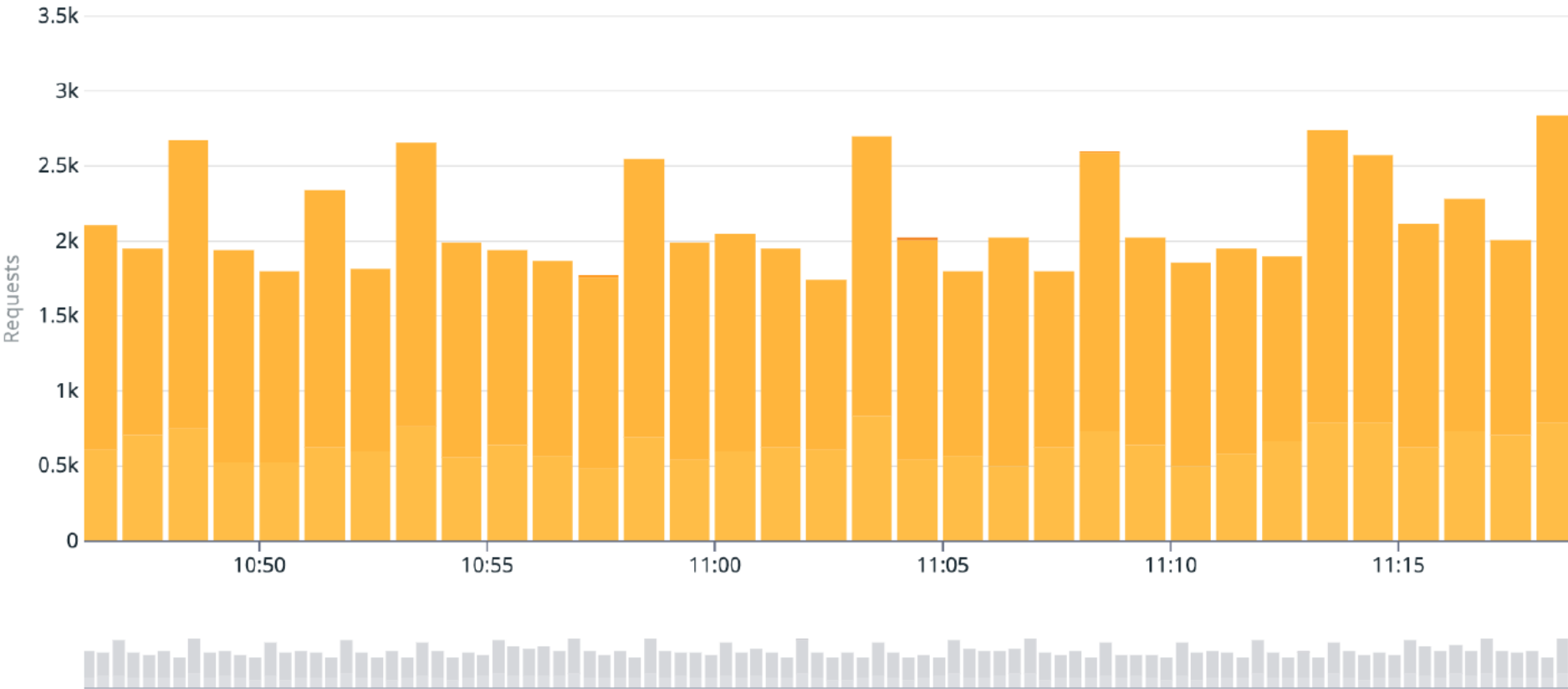
@slack-Datadog\_Incidents-shopist-ops @oncall-gs-oncall @scott.gerring@datadoghq.com



## Your infrastructure 19

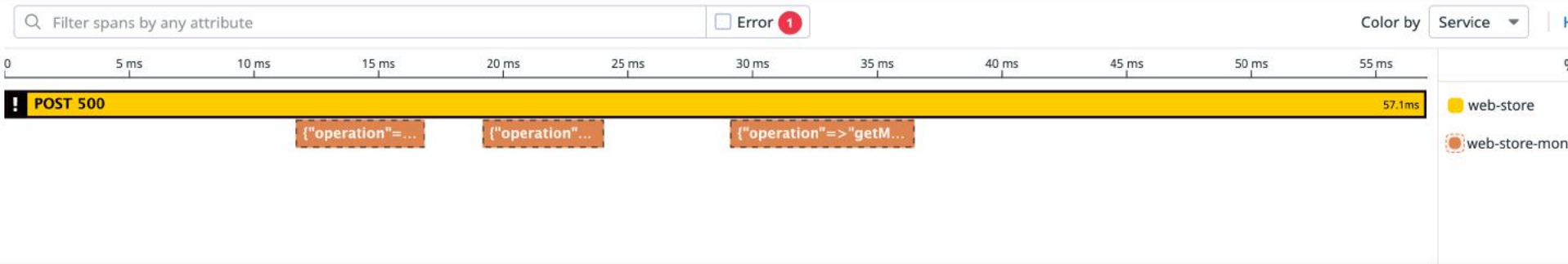


# ELBs with Most Requests



57.1ms | POST /checkout\_v2 **500 INTERNAL SERVER ERROR** Jun 01 23:33:10.609 (12h ago)

Trace: Flame Graph Waterfall Span List 4 Map



web-store rack.request POST 500

57.1ms 100% total

Span: Overview Errors 1 Infrastructure Metrics Logs 1 Network Processes Profiles Dev Agent

web-store > POST 500

This issue is 16 days old (vqaf0-958893) - Last seen 10 hours ago (vcd13006gh-56f3d8) [View in Error Console](#)

Pretty Raw

**ArgumentError: mday out of range**

```
> lib/version_helper.rb:51:in `utc': mday out of range (ArgumentError)
>   from lib/version_helper.rb:51:in `get_twice_daily_version'
>   from controllers/application_controller.rb:115:in `add_version_tag'
```

[Show 78 third-party frames](#)

🔗 37 Open ✓ 1,986 Closed



Author ▾

Label ▾

Projects ▾

Milestones ▾

Reviews ▾

Assignee ▾

Sort ▾



**Fix that pesky runtime issue** ✓



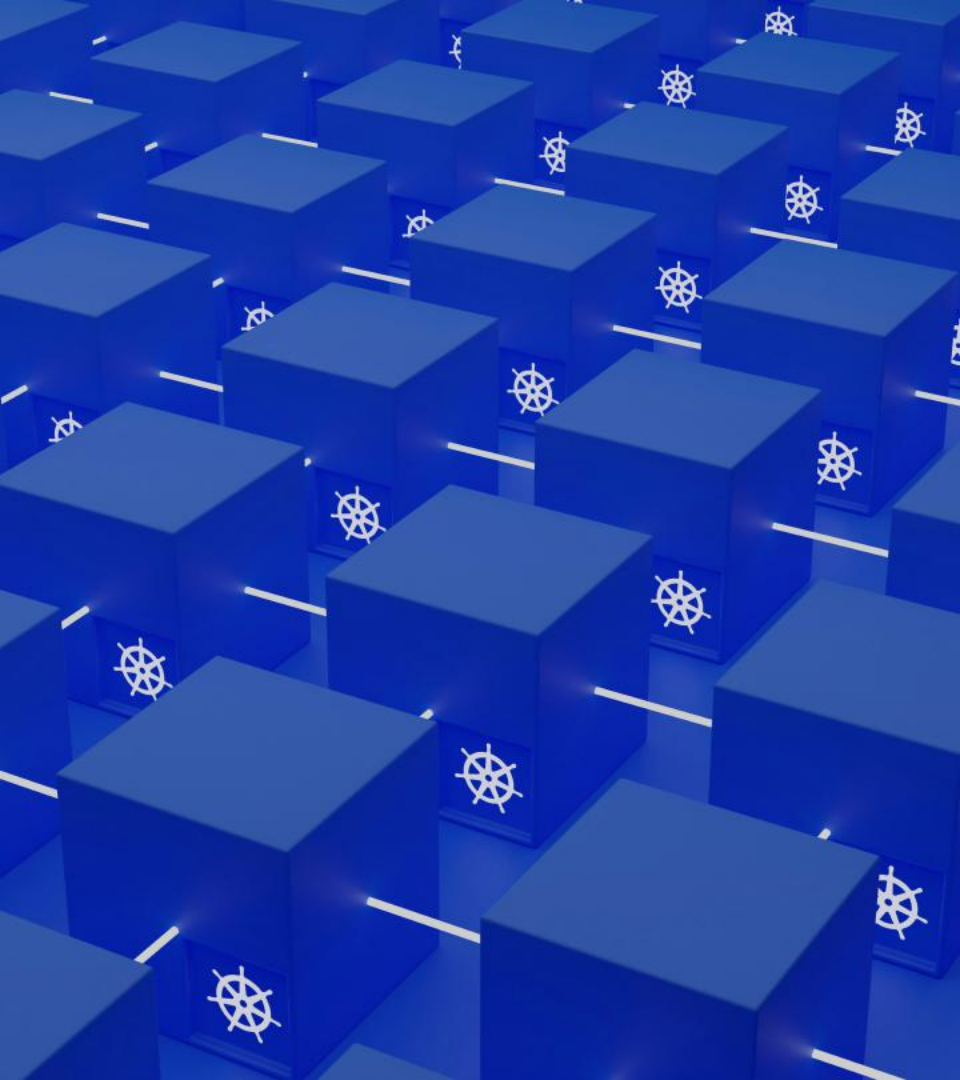
104

#1965 by Fred Developer was merged on Aug 23, 2024 • Approved  2 of 4 tasks

Back to Basics:

# Crafting Quality Software in the Age Of Complexity

Scott Gerring, Datadog



**Microservices!**

**The Cloud!**

**GenAI!**



# GenAI

```
/// A simple function to generate a random axis (0, 1, or 2)
/// We'd normally use a proper random number generator,
/// but for simplicity we'll just use a deterministic pattern
fn rand_axis() -> usize {
    static mut COUNTER: usize = 0;

    unsafe {
        COUNTER = (COUNTER + 1) % 3;
        COUNTER
    }
}
```

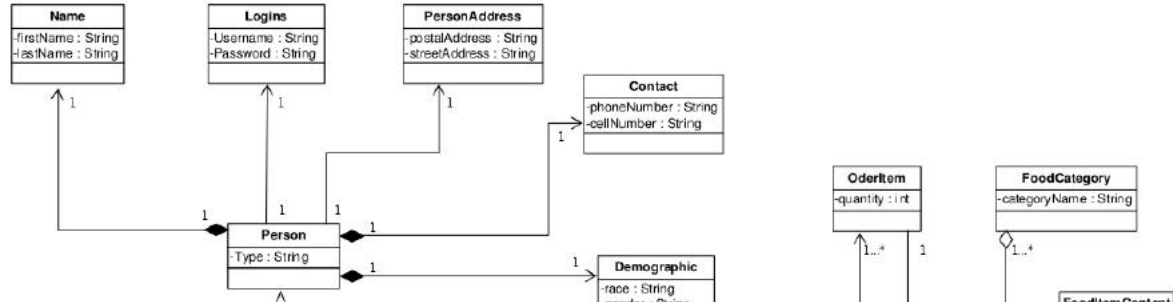
**Quality ... you know what it is, yet you don't know what it is.**

- **Robert Pirsig**

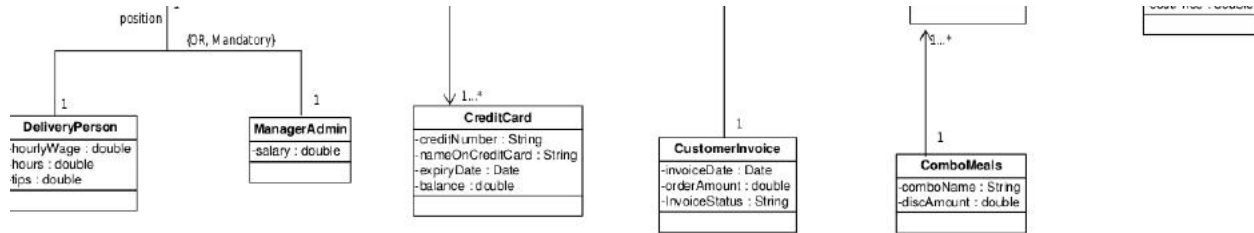


**“The earlier you catch  
defects, the cheaper they are  
to fix”**

David Farley, on not shooting yourself in  
the foot in production



# Thoughtful Design



A still life photograph of a single orange with several green leaves attached to its stem. The orange is positioned in the lower right quadrant, resting on a dark, textured surface. The leaves are spread out to the left and slightly behind the orange. The background is a solid, dark color, creating a high contrast with the bright orange and green. The lighting is soft, highlighting the texture of the orange's peel and the veins on the leaves.

# Static Analysis

10. *Rule:* All code must be compiled, from the first day of development, with *all* compiler warnings enabled at the compiler's most pedantic setting. All code must compile with these setting without any warnings. All code must be checked daily with at least one, but preferably more than one, state-of-the-art static source code analyzer and should pass the analyses with zero warnings.

*Rationale:* There are several very effective static source code analyzers on the market today, and quite a few freeware tools as well.<sup>2</sup> There simply is no excuse for any software development effort not to make use of this readily available technology. It should be considered routine practice, even for non-critical code development.



# Linting & Style Checks

Easy, Fast, Cheap





“Gofmt’s style is no one’s favorite, yet gofmt is everyone’s favorite.”

# Common Tools

- **Java** - Spotbugs, Checkstyle, Spotless, Error Prone, PMD, ...
- **.net** - Roslyn Analyzers, StyleCop
- **Python** - pylint / flake8
- **Rust** - clippy / rustfmt
- **Agnostic**: Megalinter, Sonar

# Linting Recommendations

## Do:

- Use a **modern** linter!
- Embrace **Opinionated Formatting Tools** like **Spotless**
- Everything checked in CI and trivial to run locally

# **Demo:**

## **Project Setup & Core Linting**

“Jane in security keeps telling me to ‘fix the log4shells’. We’ve not touched the codebase in years, and I have no idea what she’s talking about anyway”.

# Software Composition Analysis

We put an exploit in your  
supply chain so you can  
mine bitcoin while you  
deliver business value



Filters

Labels 11

Milestones 0

New pull request

Clear current search query, filters, and sorts

☐ 20 Open ✓ 18 Closed

Author ▾

Label ▾

Projects ▾

Milestones ▾

Reviews ▾

Assignee ▾

Sort ▾

☐  Bump typescript from 5.6.3 to 5.7.3 × dependencies no-pr-activity


#38 opened on Feb 1 by dependabot bot

1

☐  Bump @iconify-json/mdi from 1.2.1 to 1.2.3 × dependencies no-pr-activity

#37 opened on Feb 1 by dependabot bot

1

☐  Bump astro-expressive-code from 0.37.1 to 0.40.1 × dependencies no-pr-activity

#36 opened on Feb 1 by dependabot bot

1

☐  Bump @astrojs/tailwind from 5.1.1 to 6.0.0 × dependencies no-pr-activity

#35 opened on Feb 1 by dependabot bot

1

☐  Bump prettier-plugin-tailwindcss from 0.6.8 to 0.6.11 × dependencies no-pr-activity

#34 opened on Feb 1 by dependabot bot

1

☐  Bump @astrojs/rss from 4.0.7 to 4.0.11 × dependencies no-pr-activity


#33 opened on Feb 1 by dependabot bot

1

☐  Bump @tailwindcss/typography from 0.5.15 to 0.5.16 × dependencies no-pr-activity

#32 opened on Feb 1 by dependabot bot

1

☐  Bump satori from 0.11.2 to 0.12.1 × dependencies no-pr-activity

#31 opened on Feb 1 by dependabot bot

1

☐  Bump react-utl-directive from 2.0.0 to 2.1.0 × dependencies no-pr-activity

1

# Dependabot alerts

[Give feedback](#)



Dependency files checked 2 minutes ago

☐ **14 Open**    ☒ 0 Closed

Package ▾    Ecosystem ▾    Manifest ▾    Severity ▾    Sort ▾

☐ **Misuse of ServerConfig.PublicKeyCallback may cause authorization bypass in golang.org/x/crypto** Critical

#1 opened 2 minutes ago • Detected in golang.org/x/crypto (Go) • apps/pass-api/go.mod

☐ **Borsh serialization of HashMap is non-canonical** High

#10 opened 2 minutes ago • Detected in hashbrown (Rust) • apps/pass-image-api/Cargo.lock

☐ **golang.org/x/crypto Vulnerable to Denial of Service (DoS) via Slow or Incomplete Key Exchange** High

#3 opened 2 minutes ago • Detected in golang.org/x/crypto (Go) • apps/pass-api/go.mod

☐ **ring has some AES functions that may panic when overflow checking is enabled in** Moderate

#14 opened 2 minutes ago • Detected in ring (Rust) • apps/pass-image-api/Cargo.lock

☐ **Some AES functions may panic when overflow checking is enabled in ring** Moderate

#12 opened 2 minutes ago • Detected in ring (Rust) • apps/pass-image-api/Cargo.lock

☐ **`idna` accepts Punycode labels that do not produce any non-ASCII when decoded** Moderate





**So many  
tools!**

# Software Composition Analysis Recommendations

- You're going to want to do this ...
- ... and **GitHub's** default tooling is a great low effort way to start

“I want to make sure that Joe the Intern is automatically prevented from passing unescaped user input to raw SQL queries ”

# Getting Weird(er)

Semgrep, CodeQL,  
and Static  
Application Security  
Testing



**CodeQL** – Query your codebase

## Choose a workflow

Build, test, and deploy your code. Make code reviews, branch management, and issue triaging work the way you want. Select a workflow to get started.

Skip this and [set up a workflow yourself](#) →

## Categories

## Deployment

## Security

## Continuous integration

## Automation

Pages

code scanning

Found 78 workflows

## CodeQL Analysis

By GitHub

Security analysis from GitHub for C, C++, C#, Go, Java, JavaScript, TypeScript, Python, Ruby, Kotlin and Swift developers.

## Configure

Code scanning 

## Fortify Scan

By OpenText

Integrate Fortify's comprehensive static code analysis (SAST) for 33+ languages into your DevSecOps workflows.

## Configure

Code scanning 

**Snyk Security**

By Snyk

Detect vulnerabilities across your applications and infrastructure with the Snyk platform.

## Configure

Code scanning 

## Codacy Security Scan

By Codacy

Free, out-of-the-box, security analysis provided by multiple open source static analysis tools.

## Configure

Code scanning 

## APIsec Scan

By AP/Sec

APIsec provides the industry's only automated and continuous API testing platform that uncovers security vulnerabilities and logic flaws in APIs.

### Configure

Code scanning ●

DevSkim

By Microsoft CST-E

DevSkim is a security linter that highlights common security issues in source code.

### Configure

Code scanning 

## EthicalCheck

## Mayhem for API

NeuraLegion

## CodeQL & Java — things you can find

- Query built from user-controlled sources
- Externally controlled string lands in a command line exec
- Information disclosure through error messages
- Hardcoded passwords
- ... and much more!

# CodeQL

```
module LiteralToURLConfig implements DataFlow::ConfigSig {
  predicate isSource(DataFlow::
Node source) {
    source.asExpr() instanceof StringLiteral
  }

  predicate isSink(DataFlow::
Node sink) {
    /* check if this is used to construct a URL */
  }
}

module LiteralToURLFlow = DataFlow::Global
<LiteralToURLConfig>;

from DataFlow::
Node src, DataFlow::Node sink
where LiteralToURLFlow::flow(src, sink)
select src,
"This string constructs a URL $@.", sink, "here"
```



# Semgrep

```
> semgrep --lang java --pattern 'public static void main(...)'
```

1 Code Finding

```
.mvn/wrapper/MavenWrapperDownloader.java  
37| public static void main(String[] args) {
```

# Semgrep

```
> semgrep --lang java --pattern '@Path($A) public class $C { ... } '
```

## 2 Code Findings

```
src/main/java/com/datadoghq/stickerlandia/common/health/HealthResource.java
```

```
13| @Path("/health")
```

```
14| public class HealthResource {
```

```
...
```

```
src/main/java/com/datadoghq/stickerlandia/stickercatalogue/StickerResource.java
```

```
32| @Path("/api/stickers/v1")
```

```
33| public class StickerResource {
```

```
...
```

# Semgrep

rules:

- id: entity-import-in-resource  
pattern: import \$PACKAGE.entity.\$CLASS;  
languages: [java]  
severity: WARNING  
message: Entity import detected in Resource class  
paths:
  - include:
    - ".\*Resource\\.java\$"

# SAST, CodeQL, and friends

## Recommendations

- **SAST**
  - You're going to want to do this, too
  - Lean into what you already have available
  - Lots of overlap with SAST tools (Sonar, Snyk, etc.)
- **Code Querying**
  - Is a fun past-time and lets you start to build a metal model of your code

“I want to formalise my model of the architecture of my service to keep it on the rails over time”

# Architecture Testing

Automatically  
enforcing your  
mental model





# Arch Rules like ...

- **Layering** - Things named **.\*Resource** shouldn't import things from **javax.persistence**
- **Containment** - Classes named **.\*DTO** should reside in packages named **".dto\$"**
- **Consistency** - Classes implementing **IThingDoer** should be named **.\*ThingDoer**
- **Cycle Checks** - Slices in my application should be free of cycles



```
@Test
void sticker_domain_should_not_import_award_domain() {
    ArchRule rule = noClasses()
        .that()
            .resideInAPackage("..sticker..")
        .should()
            .dependOnClassesThat()
                .resideInAPackage("..award..")
            .because("domains should be isolated");

    rule.check(classes);
}
```

# Architecture Testing: Recommendations

- Check it out!

# **Demo:**

## **Architecture & Tech Enforcement**



# Dynamic Analysis

**Observability**



# Observability Is:

- **Logs**
- **Traces**
- **Metrics**

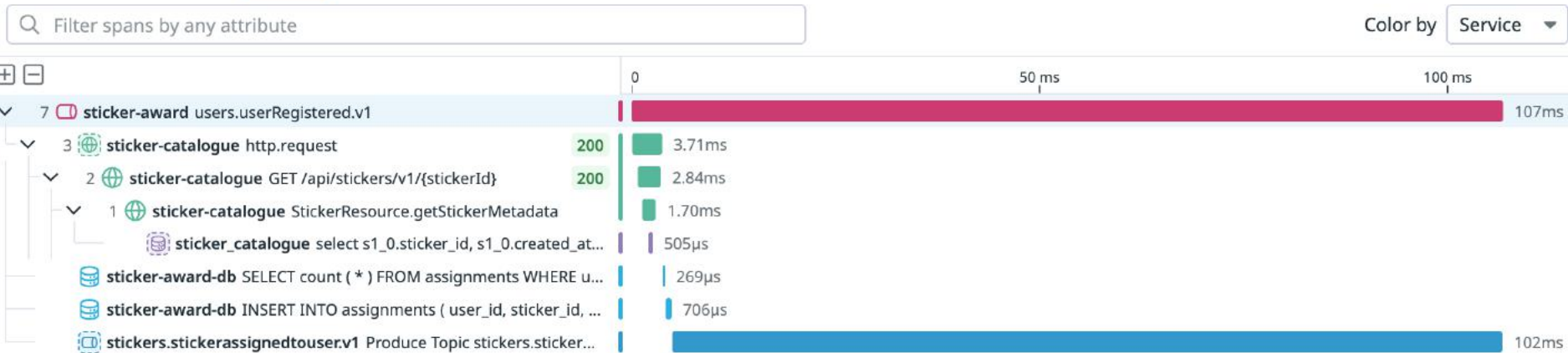




Tracing

🕒 107ms | Aug 26 14:23:48.277 (20h ago)

Trace: [Flame Graph](#) [Waterfall](#) [Span List](#) 8 [Map](#)



sticker-award process\_users.userRegistered.v1 users.userRegistered.v1

🕒 107ms 100% total exec time 📄

Span: [Overview](#) [Infrastructure](#) [Metrics](#) [Logs](#) 6 [Network](#) [Processes](#) [SQL Queries](#) 3 [Profiles](#)

SORT BY [Duration](#)

☐ Show only queries with errors

> sticker-award-db 🕒 706µs | Aug 26, 2025 at 2:23:48.281 pm

[View Query in APM](#) →

INSERT INTO assignments ( user\_id, sticker\_id, assigned\_at, removed\_at, reason, created\_at, updated\_at ) VALUES ( ? ) RETURNING id



p1 1.61ms | GET http://pass-summary-api:80... **500 INTERNAL SERVER ERROR** Aug 25 07:56:38.552 (2d ago)

Trace: Flame Graph Waterfall Span List 6 Map

Filter spans by any attribute

☐ Errors 6

Color by Service ▼



pass-summary-api netty.connect ! netty.connect

59.6μs 3.69% total exec time

Span: Overview Errors 6 Infrastructure Metrics Logs 0 Network Processes Profiles

▼ Error Message !

**io.netty.channel.AbstractChannel\$AnnotatedConnectException:** Connection refused: pass-api/172.20.83.30:8080

[View stack trace](#)

> Pinned Span Attributes ≡ No pinned tags found !

# Tracing - Getting Started

- Auto- vs. manual- instrumentation
- Explicit vs implicit collection

```
Default
sticker-catalogue java -javaagent:./dd-java-agent.jar -jar ./target/quarkus-app/quarkus-run.jar
Java HotSpot(TM) 64-Bit Server VM warning: Sharing is only supported for boot loader classes because bootstrap classpath has been appended
[dd.trace 2025-08-27 14:49:47:700 +0200] [dd-task-scheduler] INFO datadog.trace.agent.core.StatusLogger - D
ATADOG TRACER CONFIGURATION {"version":"1.52.1~6b6db17410","os_name":"Mac OS X","os_version":"15.6","archi
tecture":"aarch64","lang":"jvm","lang_version":"23","jvm_vendor":"Oracle Corporation","jvm_version":"23+37-2
369","java_class_version":"67.0","http_nonProxyHosts":"local|*.local|169.254/16|*.169.254/16","http_proxyHo
st":"null","enabled":true,"service":"quarkus-run","agent_url":"http://localhost:8126","agent_error":false,"
debug":false,"trace_propagation_style_extract":["datadog","tracecontext","baggage"],"trace_propagation_styl
e_inject":["datadog","tracecontext","baggage"],"analytics_enabled":false,"priority_sampling_enabled":true,"
logs_correlation_enabled":true,"profiling_enabled":false,"remote_config_enabled":true,"debugger_enabled":fa
lse,"debugger_exception_enabled":false,"debugger_span_origin_enabled":false,"debugger_distributed_debugger_
enabled":false,"appsec_enabled":"ENABLED_INACTIVE","rasp_enabled":true,"telemetry_enabled":true,"telemetry_
dependency_collection_enabled":true,"telemetry_log_collection_enabled":true,"dd_version":"","health_checks_
enabled":true,"configuration_file":"no config file present","runtime_id":"e5fdec82-62bc-4f8a-998c-a396807fe
3f0","logging_settings":{"levelInBrackets":false,"dateTimeFormat":"' [dd.trace 'yyyy-MM-dd HH:mm:ss:SSS Z'] '
","logFile":"System.err","configurationFile":"simplelogger.properties","showShortLogName":false,"showDateTi
me":true,"showLogName":true,"jsonEnabled":false,"showThreadName":true,"defaultLogLevel":"INFO","warnLevelSt
ring":"WARN","embedException":false},"cws_enabled":false,"cws_tls_refresh":5000,"datadog_profiler_enabled":
false,"datadog_profiler_safe":true,"datadog_profiler_enabled_overridden":false,"data_streams_enabled":false
}
^C
--/  _  \ / / / / _ | / _ \ / / / / / _ /
-/ / / / / _ / _ || , _ / , < / / _ / \ \
--\ _ _ \ _ _ _ _ / / | _ / | _ / | _ | \ _ _ _ / _ _ /
2025-08-27 14:49:48,003 WARN [io.qua.config] (main) Unrecognized configuration key "quarkus.openapi.genera
tor.input-base-dir" was provided; it will be ignored; verify that the dependency extension for this configu
```

# Auto Instrumentation

```
import io.opentelemetry.api.GlobalOpenTelemetry;
import io.opentelemetry.api.trace.Span;
import io.opentelemetry.api.trace.Tracer;
import io.opentelemetry.extension.annotations.SpanAttribute;
import io.opentelemetry.extension.annotations.WithSpan;

public class AwardService {

    private static final Tracer tracer;

    @WithSpan
    public void grantAward(@SpanAttribute("user.id") String userId) {
        Span.current()
            .setAttribute("award.type", "certification")
            .addEvent("award_grant_started");

        // ...
    }
}
```

# Manual Instrumentation

# Collection

- **Agent** - implicitly pushes from **outside** app
- **OTel SDK** - explicitly pushes from **within** app

# Tracing - Pragmatic Advice

- Instrument using OpenTelemetry APIs
- Collect using provider instrumentation





# Observability Is:

- Logs
- Traces
- Metrics
- Continuous Profiling?!1

# Manual Profiling

- Manual runs & analysis under test
- Custom builds (gprof)
- Binary rewriting (valgrind)
- Dynamic Instrumentation / eBPF (dtrace)
- Some statistical sampling (prof, JFR)







# Continuous Profiling

- Statistical sampling, load overhead
- Always on in prod
- Correlated with traces (and request metadata!)

A

UTC+02:00  
18h Aug 25, 7:50 pm – Aug 26, 2:09 pm

service:product-recommendation env:prod version:e2277f66

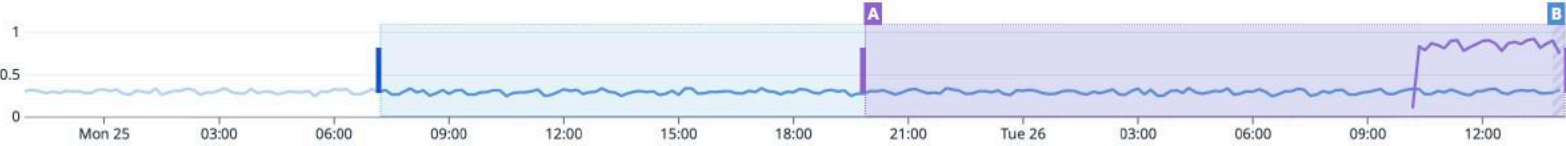


B

UTC+02:00  
1d Aug 25, 7:12 am – Aug 26, 2:09 pm

service:product-recommendation version:64c921f6

Metric CPU - Cores



Insights

Deadlocked Threads

Command Line Options Check

View 9 More Insights →

Hide Controls

Facets from Query A

Search facets

Showing 80 of 81 + Add

CORE

Env

prod 11.1K

Service

product-recommen... 11.1K

Version

aed6c793 -

e2277f66 11.1K

Host

Runtime

Compare stack traces: CPU Time -74% per Endpoints for GET /heavy\_computation -89% Visualize as: Flame Graph Table

Filter flame graph

Group by Method View Only My Code Options

A

Only in A

Average CPU Time, per minute, for GET /heavy\_computation : 19ms (< 1% of ...)

Standard Library

Tomcat

Datadog

Gateway...

Gateway...

Replacea...

EventDis...

WAFMod...

WAFMod...

WAFMod...

WAFMod...

WafCont...

WafCont...

Spring Request Handling

Tomcat

Spring Request Handling

Tomcat

Spring Request Handling

Tomcat

Spring Request Handling

Tomcat

Spring Request Handling

Datadog

Tomcat

Spring Request Handling

Unknown...

To...

Http...

Sp...

B

Less time in B -17ms More time in B +17ms Only in B

Average CPU Time, per minute, for GET /heavy\_computation : 2ms (< 1% of ...)

Standard Library

Tomcat

Datadog

GatewayBridge.onRequest...

GatewayBridge.maybePubl...

ReplaceableEventProducer...

EventDispatcher.publishDa...

WAFModule\$WAFDataCall...

WAFModule\$WAFDataCall...

WAFModule\$WAFDataCall...

WAFModule\$WAFDataCall...

ontext.run(Map, Waf\$...

ontext.run(Map, Map,...

Spring Request Handling

Tomcat

Spring Request Handling

Tomcat

Spring Request Handling

Tomcat

Spring Request Handling

Tomcat

Spring Request Handling

Datadog

Tomcat

Spring Request Handling

Unknown...

Nati...

HttpServ...

Spring R...

# Continuous Profiling - Pragmatic Advice

- Keep an eye on it! It'll be table stakes soon enough.

# Crafting Quality Software

- Quality has to be tended to over time
- Good design is good ...
- ... automated guard-rails are essential!
- Static|Dynamic analysis is here to help
- Encode structural checks for what matters

# That's it!



<https://scottgerring.com>