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Debugging at Scale in Production

Debugging at Scale in Production

Deep into your Containers with
`kubectl debug`

Shai Almog

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```
Speaker ShaiAlmog = Speaker.builder()  
    .withProfessionalExperience(30, TimeUnit.YEARS)  
    .withTopCompanies("Sun", "Oracle", "Codename One", "Lightrun")  
    .withTwitter("twitter.com/debugagent").withDms(OPEN)  
    .withMastodon("@debugagent@mastodon.social")  
    .withGitHub("github.com/shai-almog")  
    .withLinkedIn("linkedin.com/in/shai-almog-81a42/")  
    .withBlog("debugagent.com")  
    .build();
```



Practical Debugging at Scale

Cloud Native Debugging in Kubernetes
and Production

—
Shai Almog

Apress®

#1 New Release

amazon.com/dp/1484290410/



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github.com/shai-almog



@debugagent@mastodon.social

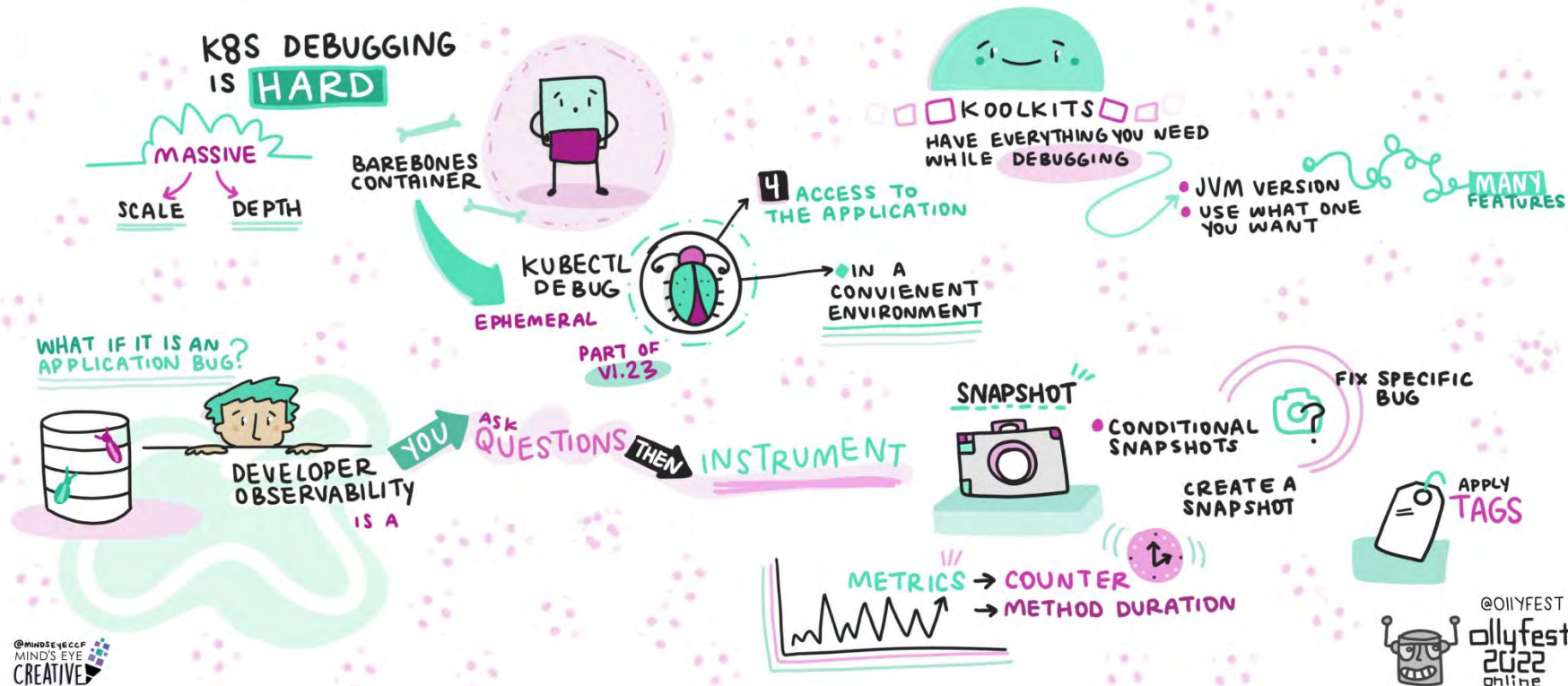


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DEBUGGING AT SCALE IN PRODUCTION

DEEP INTO YOUR CONTAINERS WITH KUBECTL DEBUG



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Debugging? Production?

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Our product: Perfectly Running Unit tests

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Failure \neq Crash

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Production Bugs are Subtle

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Kubernetes Debugging is Hard

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```
kubectl -- exec ti podname /bin/bash
```

This isn't a Local Shell

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Staging is the Dress Rehearsal to Production

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Can't Change Container

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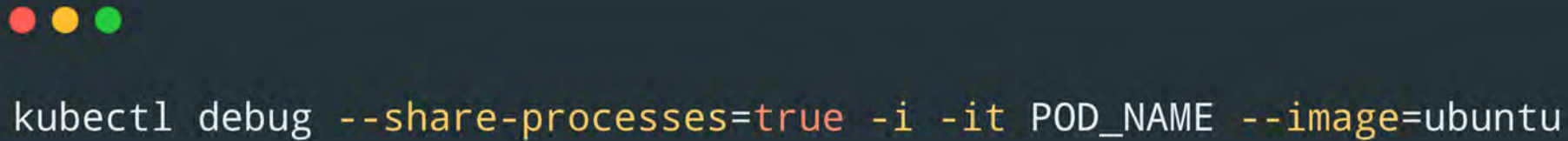
Barebone Containers

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Crashed Containers

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```
kubectl debug --share-processes=true -i -it POD_NAME --image=ubuntu
```

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Ephemeral Containers

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Sharing

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Container Image

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bash-3.2\$ █

bash-3.2\$ █

```
bash-3.2$ ps auxw | grep PrimeMain
shai          9244 100.0  0.1 427872976  34800 s007  R+   11:37AM
p=transport=dt_socket,server=y,suspend=n,address=:5005 PrimeMain
shai          9247   0.0  0.0 408628336   1600 s008  S+   11:37AM
bash-3.2$ jdb -connect com.sun.jdi.ProcessAttach:pid=
```

.../bin/ld: warning: jdb is not a shared library

Initializing jdb ...

> █

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I Like GUI

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Java Debugging Wire Protocol (JDWP)

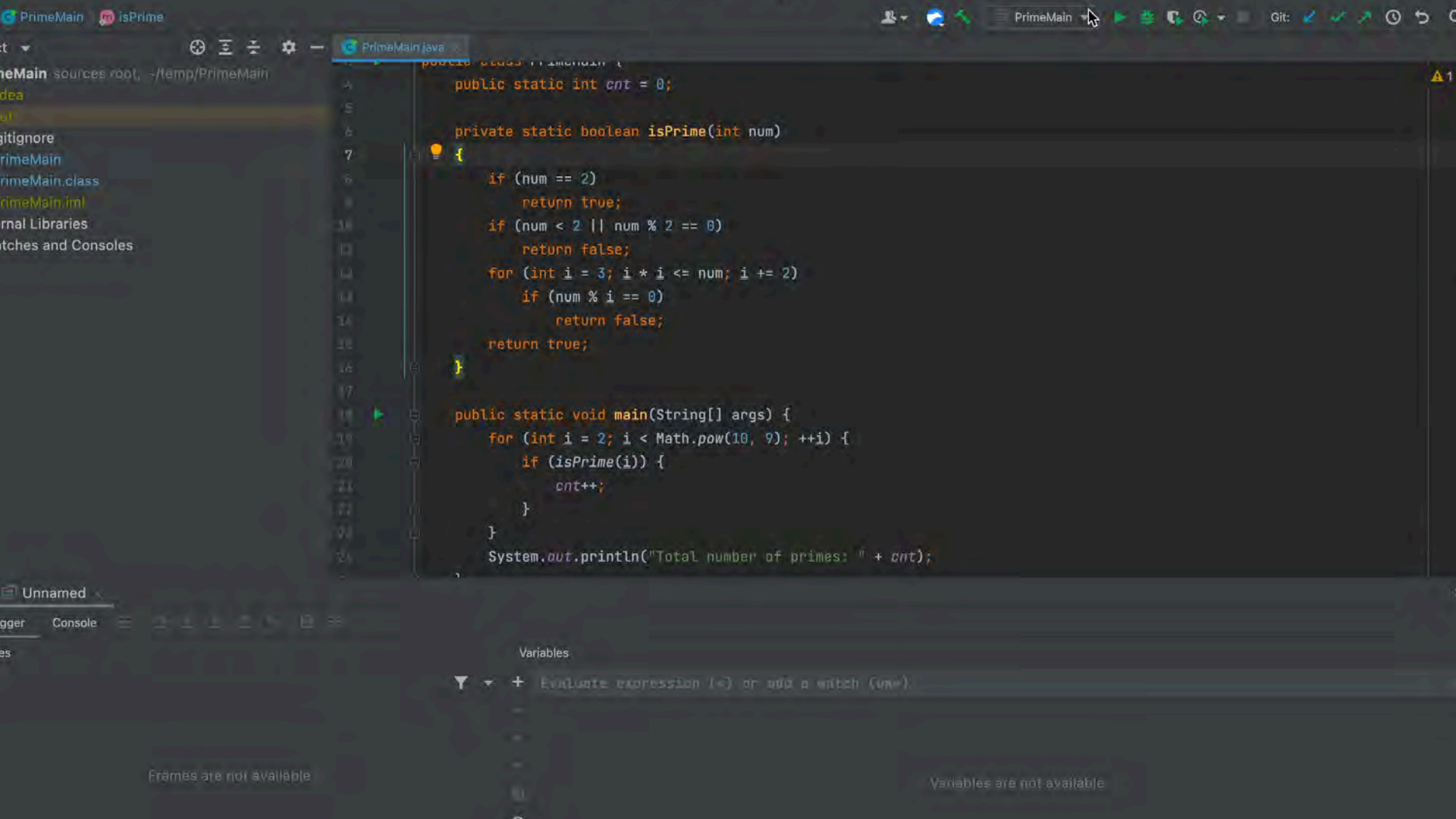
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```
ssh remoteUser@remoteHost -L 9000:127.0.0.1:9000 -N
```



```
kubectl port-forward podname 5005:5005
```



PrimeMain sources root, ~/temp/PrimeMain
PrimeMain.class
PrimeMain.iml
External Libraries
atches and Consoles

PrimeMain.java

```
public class PrimeMain {  
    public static int cnt = 0;  
  
    private static boolean isPrime(int num)  
    {  
        if (num == 2)  
            return true;  
        if (num < 2 || num % 2 == 0)  
            return false;  
        for (int i = 3; i * i <= num; i += 2)  
            if (num % i == 0)  
                return false;  
        return true;  
    }  
  
    public static void main(String[] args) {  
        for (int i = 2; i < Math.pow(10, 9); ++i) {  
            if (isPrime(i)) {  
                cnt++;  
            }  
        }  
        System.out.println("Total number of primes: " + cnt);  
    }  
}
```

Unnamed

Debugger Console

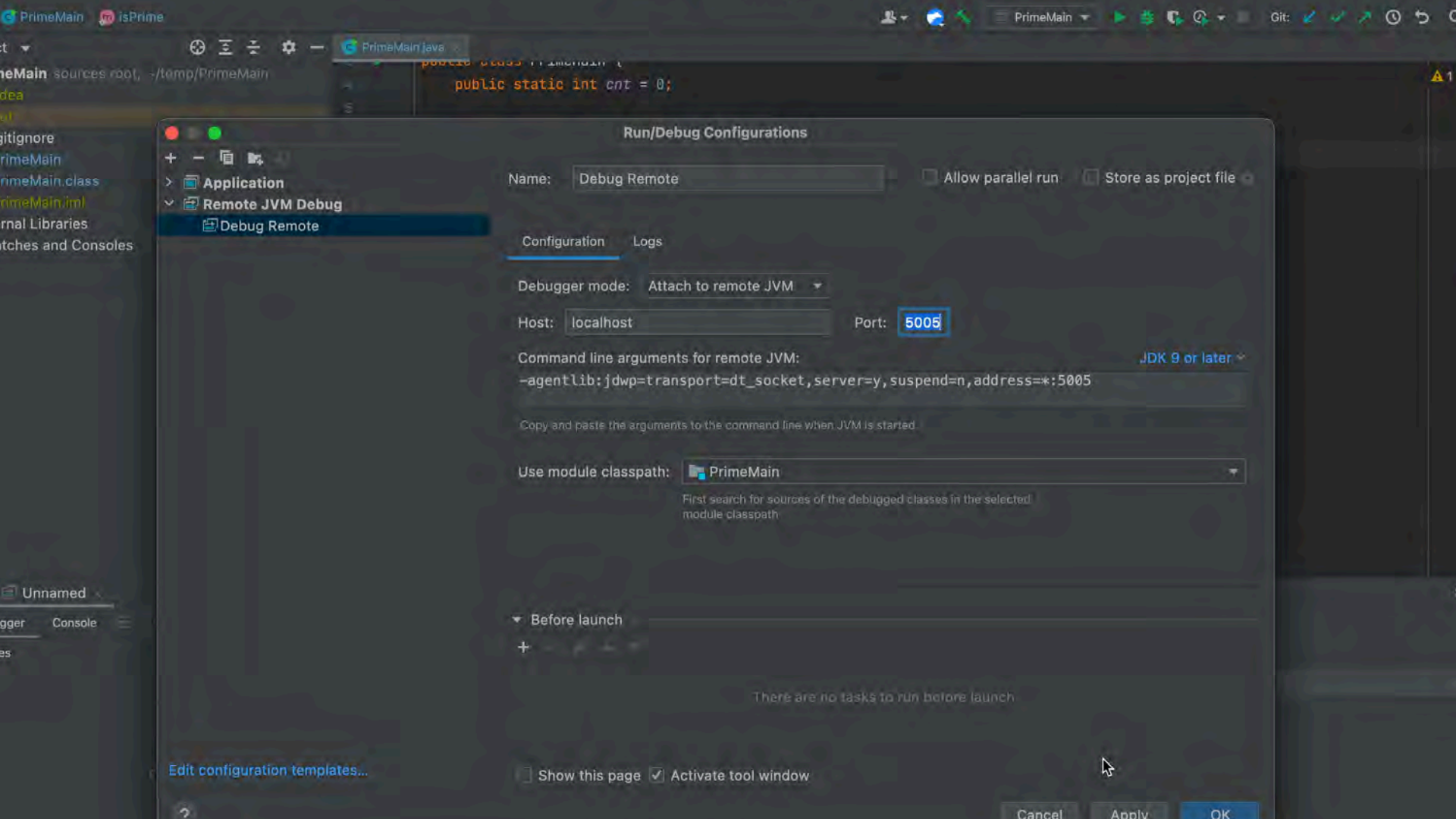
es

Variables

Evaluate expression (=) or add a watch (vw)

Frames are not available

Variables are not available



Run/Debug Configurations

+ - [icon] [icon]

> Application

> Remote JVM Debug

Debug Remote

Name: Debug Remote

☐ Allow parallel run

☐ Store as project file

Configuration Logs

Debugger mode: Attach to remote JVM

Host: localhost

Port: 5005

Command line arguments for remote JVM:

JDK 9 or later

-agentlib:jdwp=transport=dt_socket,server=y,suspend=n,address=5005

Copy and paste the arguments to the command line when JVM is started.

Use module classpath: PrimeMain

First search for sources of the debugged classes in the selected module classpath

Before launch

+

There are no tasks to run before launch.

[Edit configuration templates...](#)

☐ Show this page ☒ Activate tool window

Cancel

Apply

OK

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Restart Process

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JDWP Security = Wide Open Door

Breakpoints... Break.

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Stability Risk

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Privacy & Liability Nightmare

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Still the Small Picture

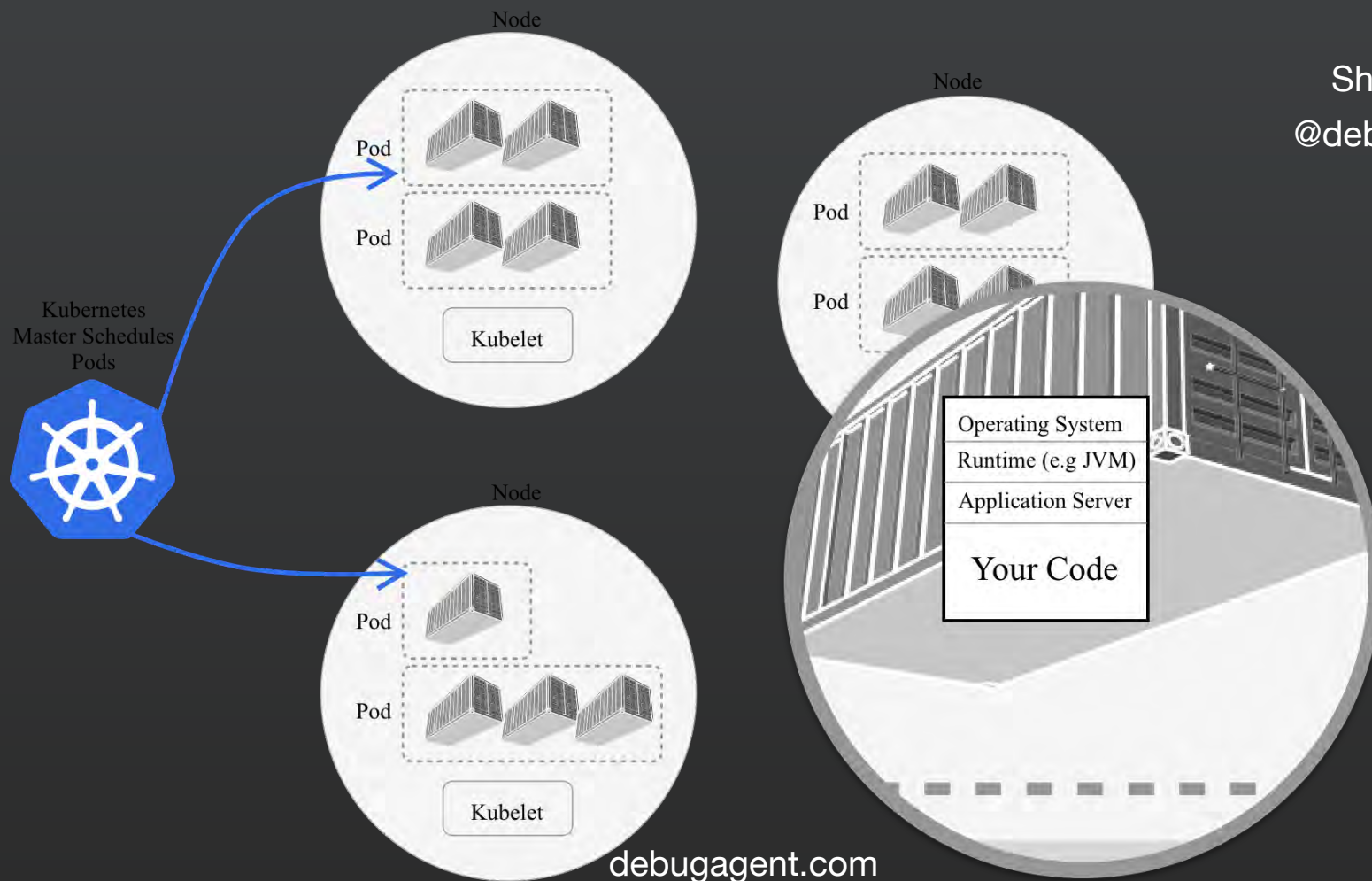
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Massive Scale

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Pod

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Operating System

Runtime (e.g JVM)

Application Server

Your Code

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Observability = New Debugging

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Observability Cost

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Observability is Geared to OPS

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It Doesn't Help with Localized Bugs

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R&D Should be in Production

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Vertical Teams

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Shift both Left and Right

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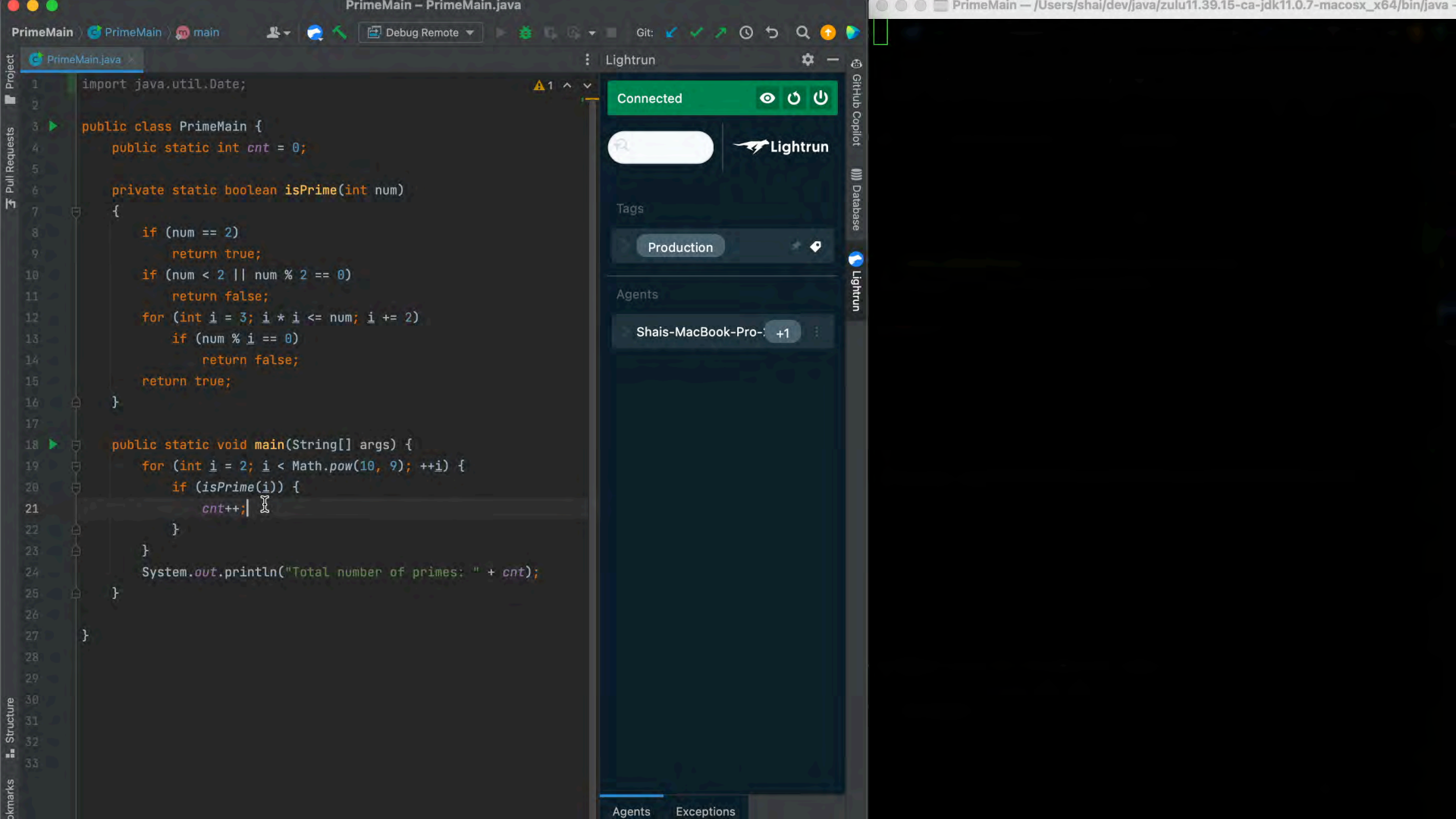
Developer Observability

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Demo

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Connected



Lightrun

Tags

Production



Agents

Shais-MacBook-Pro-


+1

GitHub Copilot

Database

Lightrun

```
public class PrimeMain {  
    public static int cnt = 0;  
  
    private static boolean isPrime(int num)  
    {  
        if (num == 2)  
            return true;  
        if (num < 2 || num % 2 == 0)  
            return false;  
        for (int i = 3; i * i <= num; i += 2)  
            if (num % i == 0)  
                return false;  
        return true;  
    }  
  
    public static void main(String[] args) {  
        for (int i = 2; i < Math.pow(10, 9); ++i) {  
            if (isPrime(i)) {  
                cnt++;  
            }  
        }  
        System.out.println("Total number of primes: " + cnt);  
    }  
}
```

 Lightrun

Tags

Production

Agents

Shais-MacBook-Pro- +1

Agents Exceptions

INFO: LOGPOINT: The value of i is 298611
cnt is 16181220

May 15, 2022 1:36:18 PM PrimeMain main

INFO: LOGPOINT: The value of i is 298611
cnt is 16181221

May 15, 2022 1:36:18 PM PrimeMain main

INFO: LOGPOINT: The value of i is 298611
cnt is 16181222

May 15, 2022 1:36:18 PM PrimeMain main

INFO: LOGPOINT: The value of i is 298611
cnt is 16181223

May 15, 2022 1:36:18 PM PrimeMain main

INFO: LOGPOINT: breakpointId: [be8431bd-
0-83fd-0b0745a6dc68]: Logpoint is paused
high call rate until log quota is restor

```
8     if (num == 2)
9         return true;
10    if (num < 2 || num % 2 == 0)
11        return false;
12    for (int i = 3; i * i <= num; i += 2)
13        if (num % i == 0)
14            return false;
15    return true;
16 }
17
18 public static void main(String[] args) {
19     for (int i = 2; i < Math.pow(10, 9); ++i) {
20         if (isPrime(i)) {
21             cnt++;
22         }
23     }
24     System.out.println("Total number of primes: " + cnt);
25 }
26
27 }
```

Production

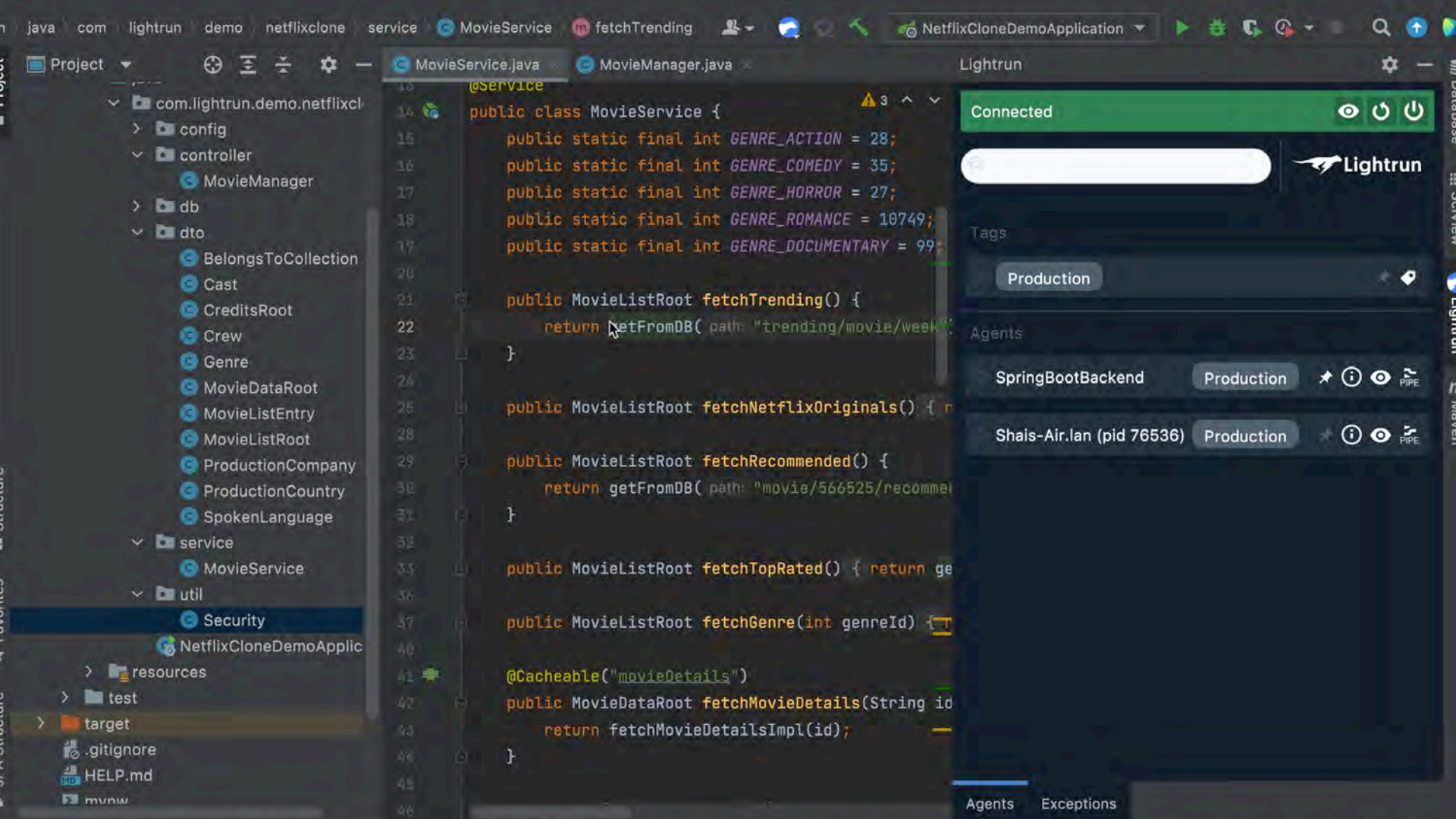
Agents

Shais-MacBook-Pro-2.local (pid 46) +1

Agents

Exceptions

There's a new plugin version on the server!



Create Snapshot

Captures all the local variables and expressions in the specified location

Agent

SpringBootBackend



File

MovieService.java

22



Expression

|

+



Condition



Max Hit Count

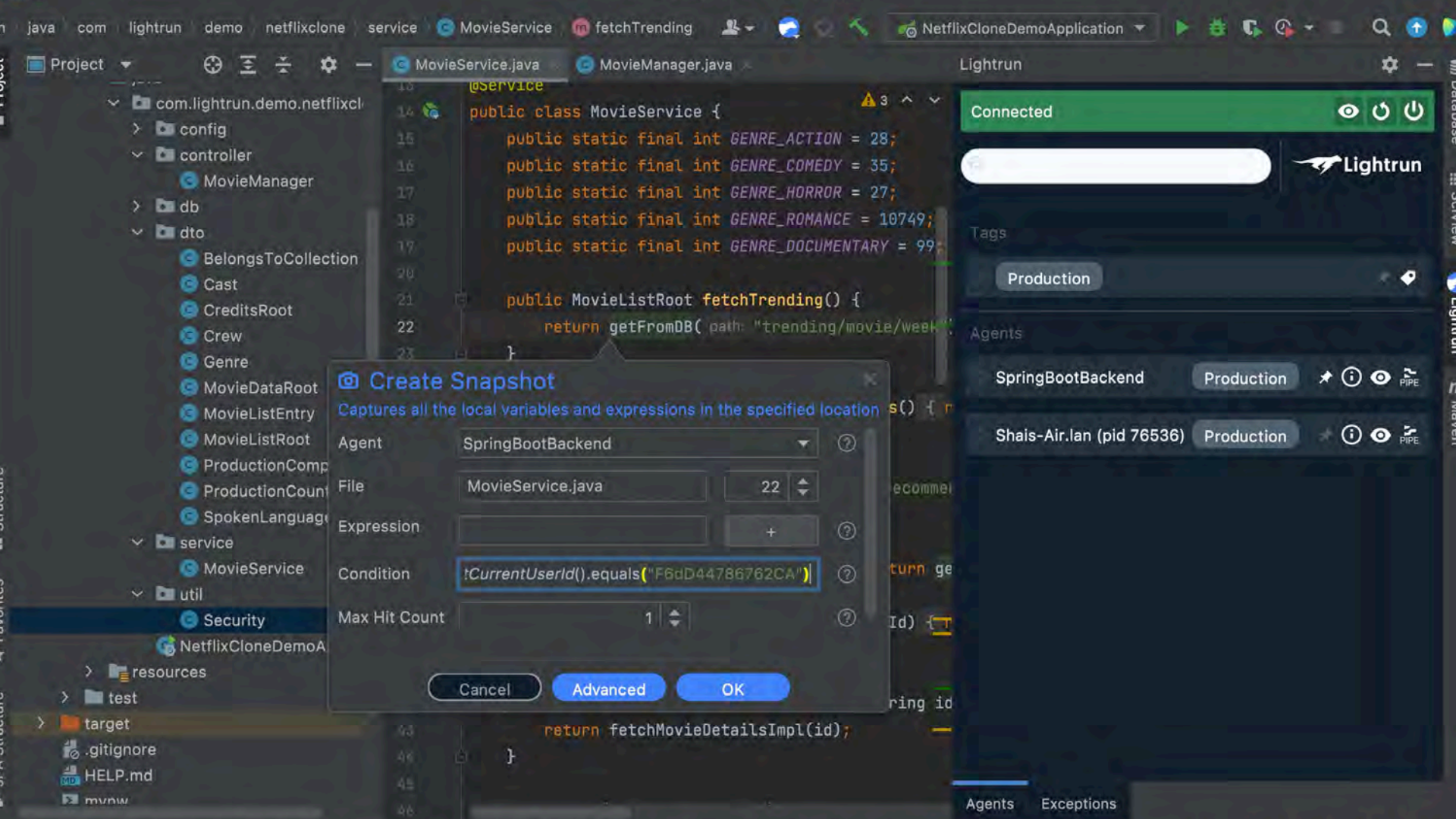
1



Cancel

Advanced

OK



- com.lightrun.demo.netflixclone
 - config
 - controller
 - MovieManager
 - db
 - dto
 - BelongsToCollection
 - Cast
 - CreditsRoot
 - Crew
 - Genre
 - MovieDataRoot
 - MovieListEntry
 - MovieListRoot
 - ProductionCompany
 - ProductionCountry
 - SpokenLanguage
 - service
 - MovieService
 - util
 - Security
 - NetflixCloneDemoApplication

```
@Service
public class MovieService {
    public static final int GENRE_ACTION = 28;
    public static final int GENRE_COMEDY = 35;
    public static final int GENRE_HORROR = 27;
    public static final int GENRE_ROMANCE = 10749;
    public static final int GENRE_DOCUMENTARY = 99;

    public MovieListRoot fetchTrending() {
        return getFromDB(path: "trending/movie/week");
    }
}
```

Create Snapshot

Captures all the local variables and expressions in the specified location

AgentSpringBootBackend

FileMovieService.java22

Expression+

Condition!CurrentUserId().equals("F6dD44786762CA")

Max Hit Count1

Cancel Advanced OK

Connected

Lightrun

Tags

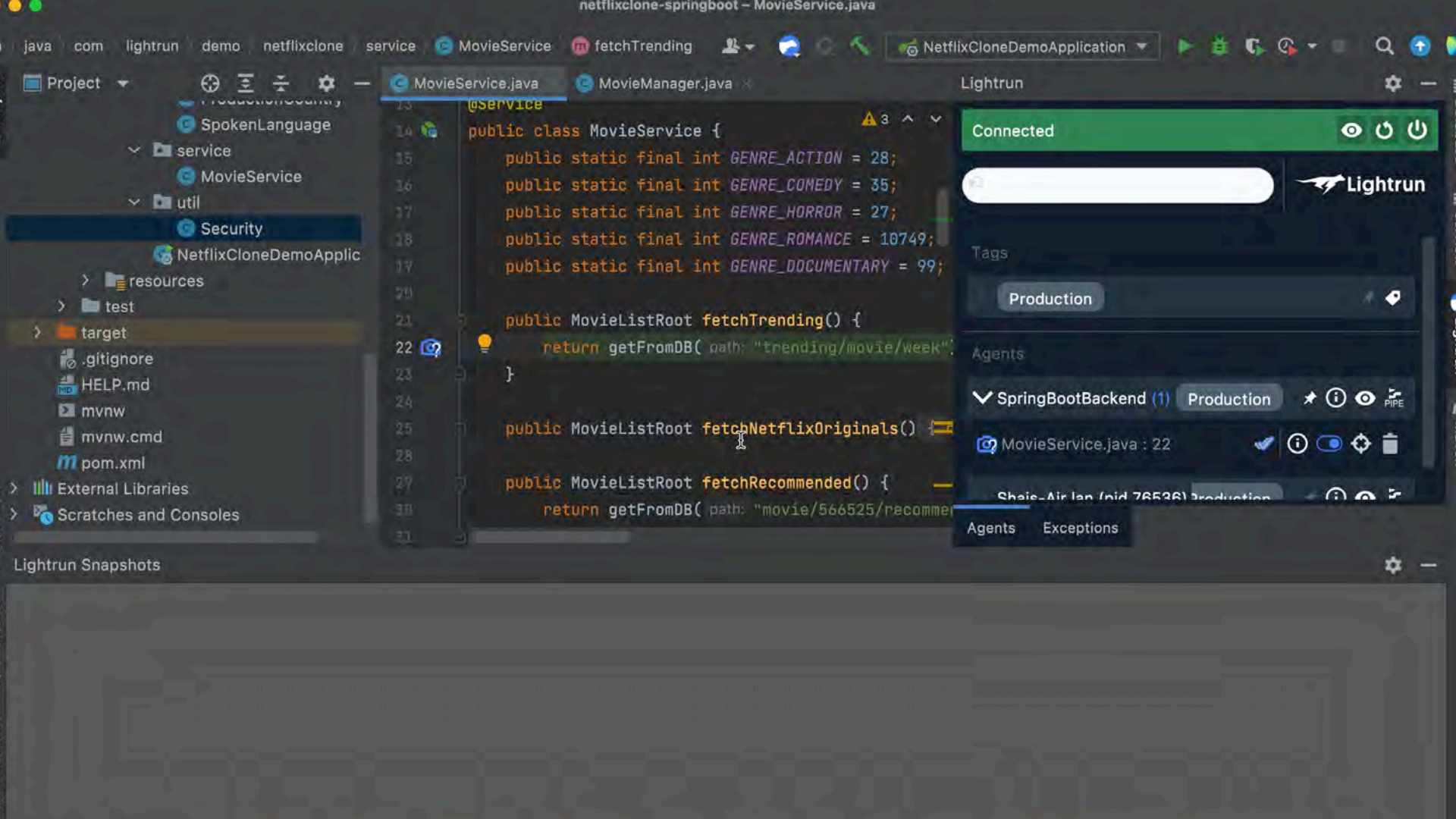
Production

Agents

SpringBootBackend Production

Shais-Air.lan (pid 76536) Production

Agents Exceptions



```
PrimeMain.java
2
3 public class PrimeMain {
4     public static int cnt = 0;
5
6     private static boolean isPrime(int num)
7     {
8         if (num == 2)
9             return true;
10        if (num < 2 || num % 2 == 0)
11            return false;
12        for (int i = 3; i * i <= num; i += 2)
13            if (num % i == 0)
14                return false;
15        return true;
16    }
17
18    public static void main(String[] args) {
19        for (int i = 2; i < Math.pow(10, 9); ++i) {
20            if (isPrime(i)) {
21                cnt++;
22            }
23        }
24        System.out.println("Total number of primes: " + cnt);
25    }
26
27 }
```

Lightrun

Connected

Lightrun

Tags

Production

Agents

Shais-MacBook-Pro-2.lc +1

Agents Exceptions



Practical Debugging at Scale

Cloud Native Debugging in Kubernetes
and Production

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Apress®

What's Next?

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