

MISSOURI COURTS

Judicial Branch of Government



E2E with Cypress

Buddy Hammond
Principal Programmer

Agenda

- SPA Tech Stack
- Cypress
- Business Driven Development
- Code Generation
- Data Driven Testing
- Performance HARs and K6
- Stats



SPA Tech Stack

- Tech stack
 - Java, JSP, Spring, JQuery, Oracle
 - Single Page Web App
 - Junit
 - VS Code
 - JRebel



BDD & Testing

- Business Analysts
 - Requirements, Specifications & Test Plans
 - Review & Approve after initial development
 - Limited regression testing which was manual
- Tests Definition in Excel Spreadsheets
 - Written in plain English – no special syntax (~~Gherkin~~)
 - Columns such as Precondition, Test Step, Expected Results
 - Row details Process
 - Provided to Users to manually test



Business Driven Development

Precondition -> Test Test -> Expected Results

Criminal Happy Pathy - Cypress Test Case.xlsx [Shared] - Excel Buddy Hammond

File Home Insert Page Layout Formulas Data Review View Help Acrobat Tell me what you want to do Share

Clipboard Font Alignment Number Styles Cells Editing

E1 Test Steps

	C	D	E	F	G
1	Test Scenario	Precondition	Test Steps	Test Data/Cases	Expected Results
2	Create New Defendant for Case	Valid user selects Enter a Cas	Navigate to the Defendant section		
3			Enter Last Name		
4			Enter First Name		
5			Expand Demographics section		
6			Enter Date of Birth		
7			Expand Address section		
8			Enter Street Address		
9			Enter City		
10			Enter Zip Code		
11			Save Defendant		Green Noty stating Defendant Saved and Adresse
12					All Defendant info is grayed out
13					Case details section is now enabled
14			In the Case tab, select default Court Location		
15			Click Case Type drop down and select case type	M1	
16			Enter Arresting Agency ORI	MO0140800	
17			Enter Filing Date - Current System Date		
18			Move to Prosecuting Attorney of Record section		
19			Click to Add PA of Record		Add Additional Prosecuting Attorney of Record b
20			Click Party Type drop down and select APA - Assistant Prosecuting Attorney		
21			In Prosecuting Attorney text field enter code and select nam	42146, Nasreen Esmail Engle	
22					

Cypress – what, why

- Modern web testing and automation
- NodeJS - Javascript
- Runs in browser alongside application
- Direct access to developer tools
- DOM & network & console
- Interact w/ elements on page same as developer
- Manage UI – auto scrolls, waits when hidden
- Wait on Network Requests
- Time Travel

Integrated debugger

The image displays an integrated development environment (IDE) for testing a web application. It is divided into several main sections:

- Top Panel:** A Microsoft Edge browser window showing a URL: `https://wwwdev.courts.mo.gov/_/#/specs/runner?file=cypress/integration/caseProcessing/criminal/criminalCaseHappyPath.feature`. The browser status bar indicates "Paused in debugger".
- Left Panel (Specs):** A Cucumber test runner interface for the feature `criminalCaseHappyPath`. It lists several `(xhr)` test steps, all of which passed with a status of `POST 200`. The current step is `Given Navigate to the Defendant section`, which includes sub-steps `And Enter Last Name` and `log`.
- Right Panel (Web Application):** A screenshot of the "Criminal Enter a Case" web form. The form includes fields for "My Defendant Search", "DL State", "Driver's Lic. No.", "Last Name", "First Name", "Middle Name", "Suffix", "Demographics", and "Address". A tooltip is visible over the "Last Name" field, showing "First & Last Name" and "First & First Name".
- Bottom Panel (Developer Tools):** The Chrome DevTools interface is open, showing the "Sources" tab. The file `tests?p=cypress...port/index.js` is open, and the `enterLastName()` function is highlighted. A "Debugger" window is open, displaying the current state of the `this.defendant` object:

```
Object
  birthDate: "03/24/1981"
  city: "Jefferson City"
  country: "US"
  firstName: "darrell"
  lastName: "wyss_1697038317172"
  middleName: "louise"
  sex: "Male"
  state: "Missouri"
  stateCode: "MO"
```

Time Travel

Microsoft Edge is being controlled by automated test software.

Specs

criminalCaseHappyPath feature 01:51

```
POST 200 /smc-web/courtLocnCodes.do
POST 200 /smc-web/getEACAdditionalInformation.do
POST 200 /smc-web/getCaseEntryCaseDesc.do
POST 200 /smc-web/getSMCInitialDockets.do
POST 200 /smc-web/getSelectPickerSearchStylePreference.do
POST 200 /smc-web/getDocketAddlDataFields.do
POST 200 /smc-web/getCaseEntryCaseDesc.do
```

24 Given Navigate to the Defendant section

25 And Enter Last Name

26 log

27 log -----CriminalCase.lastName

28 get #lastName

29 -type frank_1697039087492

30 And Enter First Name 3

34 And Expand Demographics section

35 log -----CriminalCase.expandDemographicsSection

36 get .onFocusTriggerValPrev-Demographics

37 -click


38 And Enter Date of Birth

https://wwwdev.courts.mo.gov/smc-web/login.jsp?loggedout=1

Edge 117 1000x660

User:

Password:

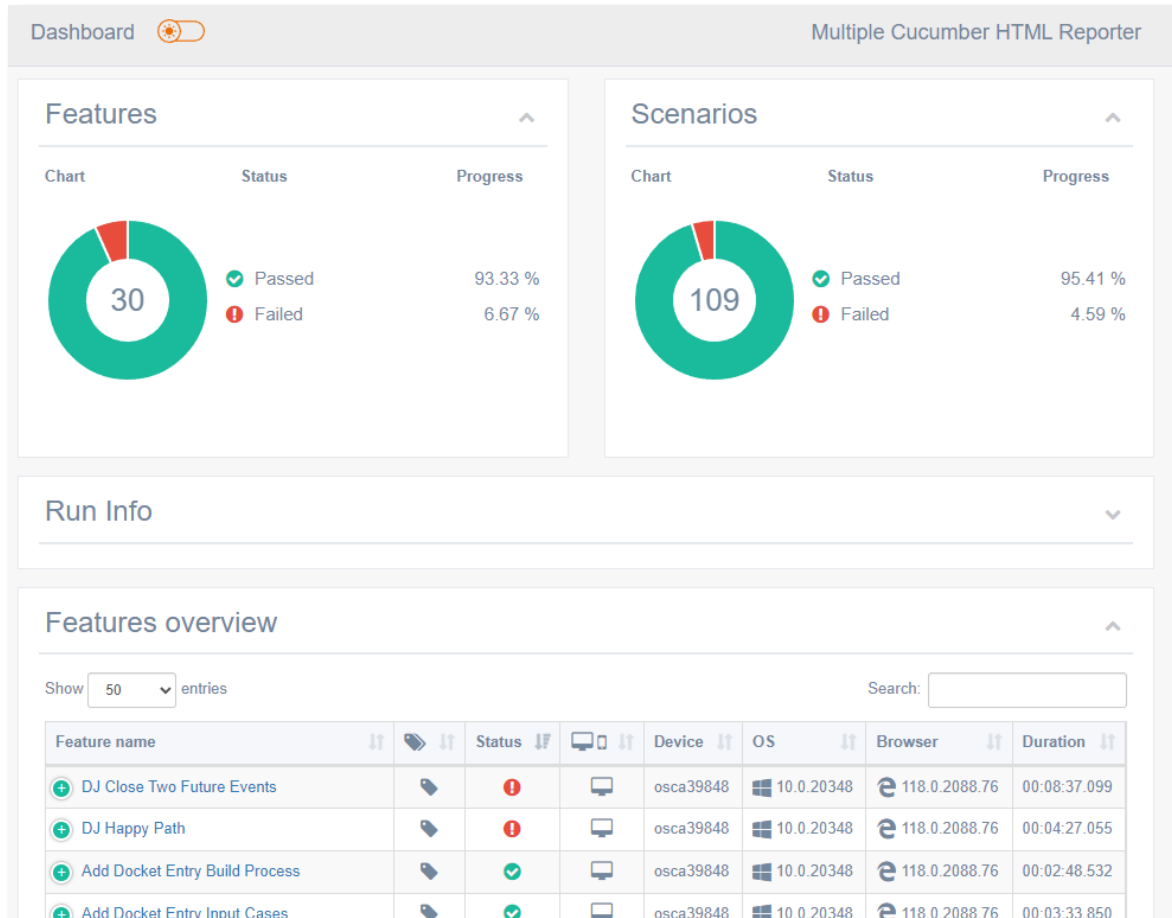
 You have been successfully logged out.

Login

SHOW-ME COURTS
Judicial Branch of Government

Build No: 0.10.46-SNAPSHOT (148e9181023fa364eddc55323f755933e6353f6)

Cypress Report



SMC Cypress Framework

- Code Generation
 - Actions – Stubbed functions
 - Steps, Features – No modification - regenerate
 - Fixtures – Data per Environment
- NodeJS scripts
 - Run Tests in Each Environment Daily
 - Each Pull Request
 - Build & Deploy SMC
 - Run Tests
 - Send reports

Code Generation

- BA Test Plan Spreadsheets
- Record of Truth
- Generate/Re Code
- Cypress BDD Framework controls Flow
- Developer implements empty functions
- Any change to Test
 - Update Spreadsheet
 - Regenerate Code



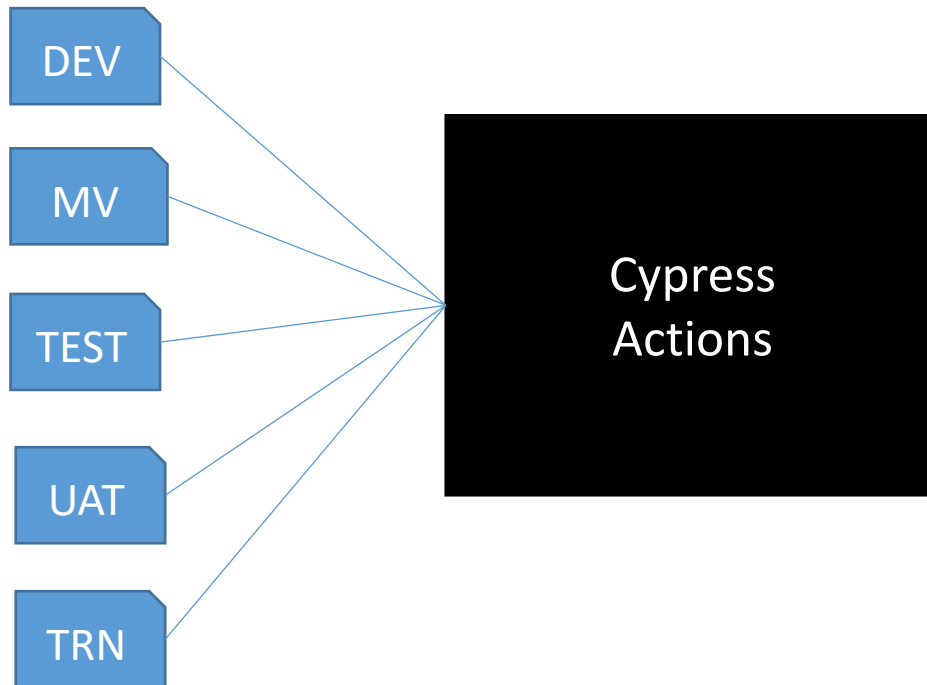
Data Driven Testing

- Scripts don't know what Environment (5)
- Some data is random – e.g. Defendant bio
- Some data is static – e.g. Court, charge, plea
- Data is specific to Scenario and Environment
- Data used to generate Tests



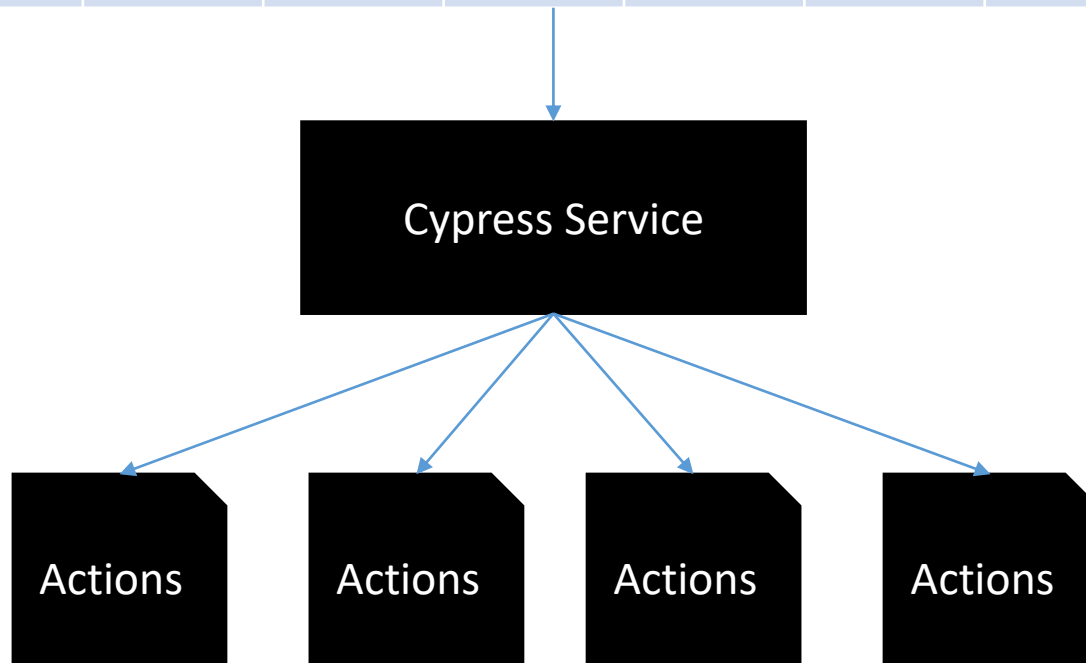
5 Environments

Each environment is different Court



Large Data Set per Service Class

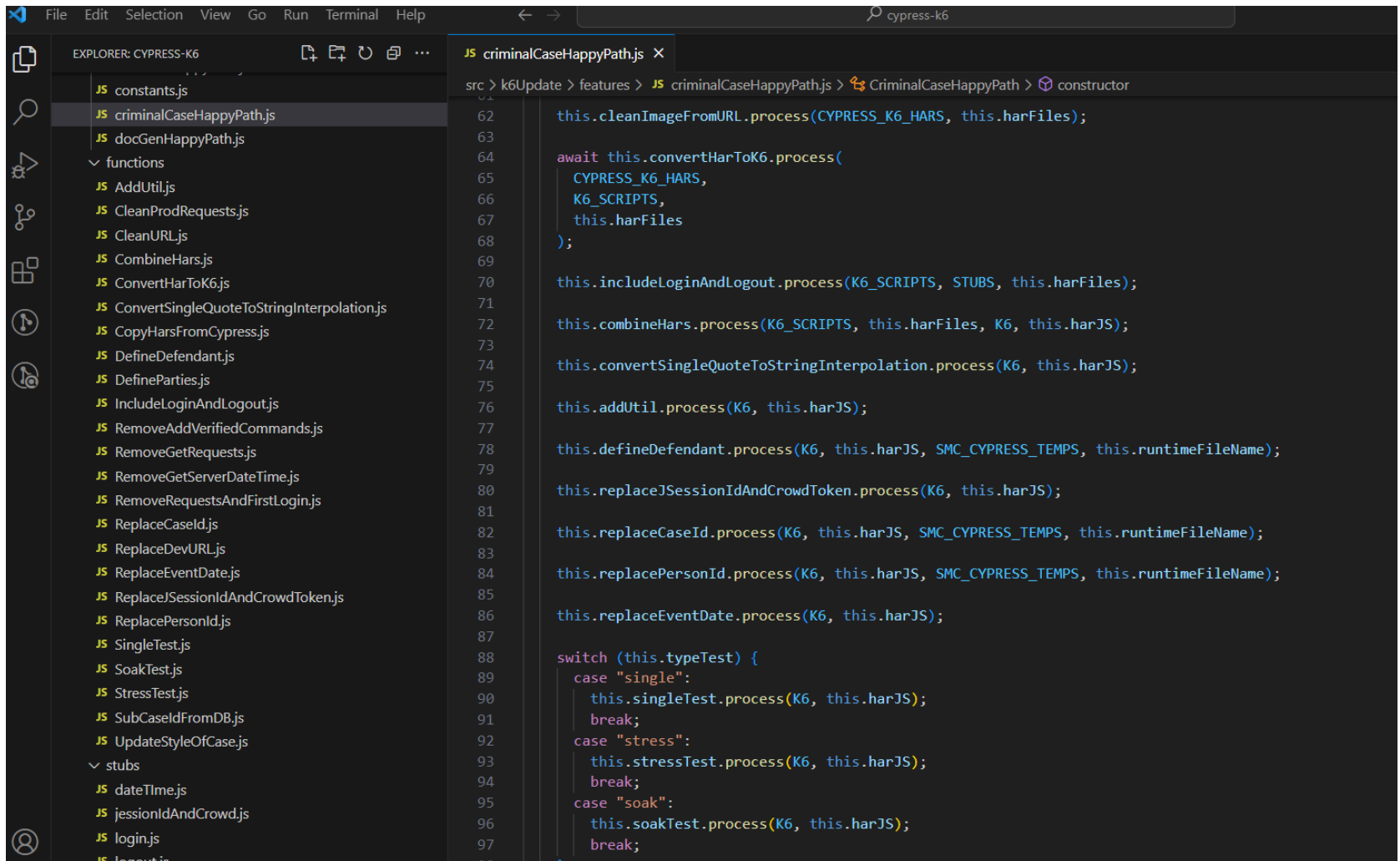
Court	Code	Agent	Atty	PAtty	ANm
ABC
DEF
...



Performance HARs & K6

- Scenario generates HAR
- HAR – HTTP Archive Format
- All network interaction – Request & Response
- Code processes HAR and generates K6
- Code manipulates K6 to built tests
- Small classes doing specific mods
- Soak, Load, Stress

HAR -> K6 Performance Generator



```
File Edit Selection View Go Run Terminal Help
EXPLORER: CYPRESS-K6
  JS constants.js
  JS criminalCaseHappyPath.js
  JS docGenHappyPath.js
  functions
  JS AddUtil.js
  JS CleanProdRequests.js
  JS CleanURL.js
  JS CombineHars.js
  JS ConvertHarToK6.js
  JS ConvertSingleQuoteToStringInterpolation.js
  JS CopyHarsFromCypress.js
  JS DefineDefendant.js
  JS DefineParties.js
  JS IncludeLoginAndLogout.js
  JS RemoveAddVerifiedCommands.js
  JS RemoveGetRequests.js
  JS RemoveGetServerDateTime.js
  JS RemoveRequestsAndFirstLogin.js
  JS ReplaceCasel.js
  JS ReplaceDevURL.js
  JS ReplaceEventDate.js
  JS ReplaceSessionIdAndCrowdToken.js
  JS ReplacePersonId.js
  JS SingleTest.js
  JS SoakTest.js
  JS StressTest.js
  JS SubCaselFromDB.js
  JS UpdateStyleOfCase.js
  stubs
  JS dateTlme.js
  JS jessionIdAndCrowd.js
  JS login.js
  JS logout.js

src > k6Update > features > JS criminalCaseHappyPath.js > CriminalCaseHappyPath > constructor
62 this.cleanImageFromURL.process(CYPRESS_K6_HARS, this.harFiles);
63
64
65 await this.convertHarToK6.process(
66   CYPRESS_K6_HARS,
67   K6_SCRIPTS,
68   this.harFiles
69 );
70
71 this.includeLoginAndLogout.process(K6_SCRIPTS, STUBS, this.harFiles);
72
73 this.combineHars.process(K6_SCRIPTS, this.harFiles, K6, this.harJS);
74
75 this.convertSingleQuoteToStringInterpolation.process(K6, this.harJS);
76
77 this.addUtil.process(K6, this.harJS);
78
79 this.defineDefendant.process(K6, this.harJS, SMC_CYPRESS_TEMP, this.runtimeFileName);
80
81 this.replaceJSessionIdAndCrowdToken.process(K6, this.harJS);
82
83 this.replaceCaseId.process(K6, this.harJS, SMC_CYPRESS_TEMP, this.runtimeFileName);
84
85 this.replacePersonId.process(K6, this.harJS, SMC_CYPRESS_TEMP, this.runtimeFileName);
86
87 this.replaceEventDate.process(K6, this.harJS);
88
89 switch (this.typeTest) {
90   case "single":
91     this.singleTest.process(K6, this.harJS);
92     break;
93   case "stress":
94     this.stressTest.process(K6, this.harJS);
95     break;
96   case "soak":
97     this.soakTest.process(K6, this.harJS);
98     break;
99 }
```

K6 Stats

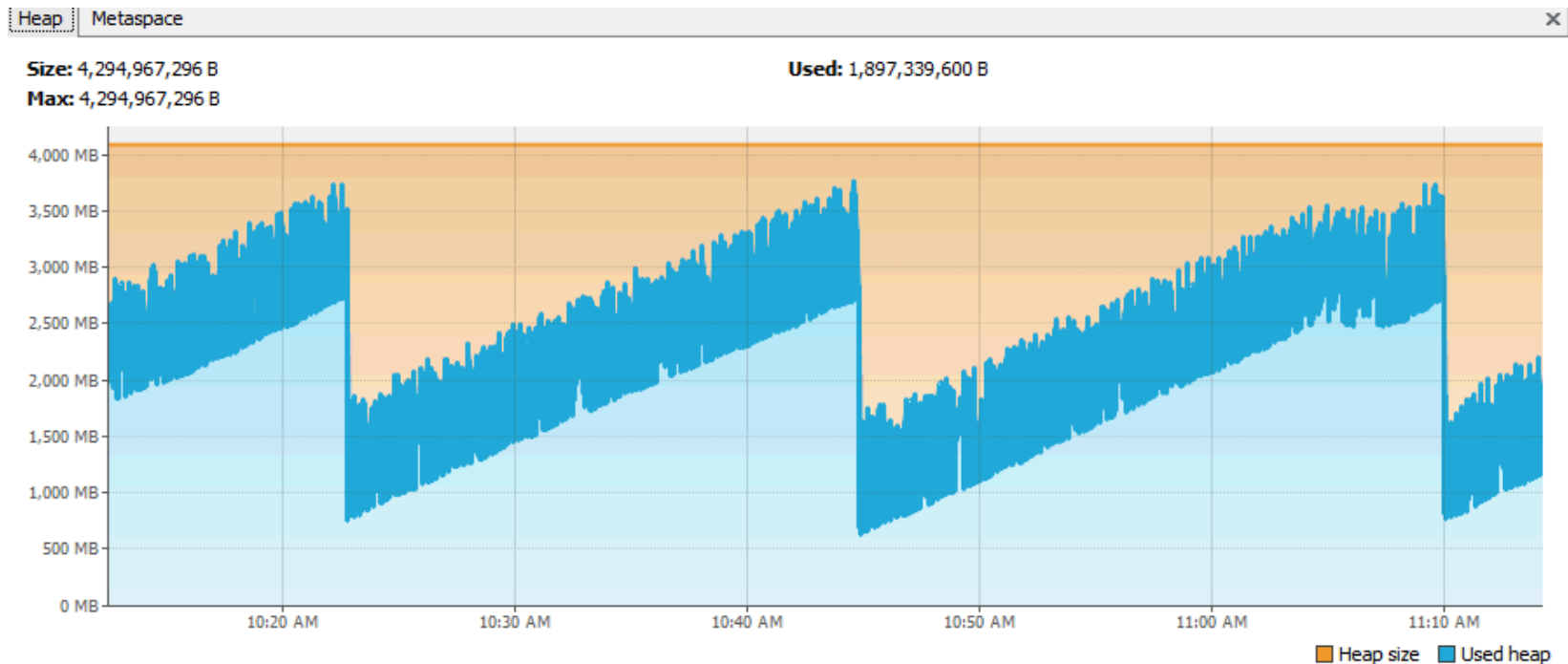
- **Soak: 5h 15m**
- **Iterations: ~13K**
- **HTTP Reqs: 9M**

```
data_received.....: 443 GB  23 MB/s
data_sent.....: 9.2 GB  486 kB/s
http_req_blocked.....: avg=33.34µs  min=0s      med=0s      max=398.39ms  p(90)=0s      p(95)=0s
http_req_connecting.....: avg=23.15µs  min=0s      med=0s      max=246ms     p(90)=0s      p(95)=0s
http_req_duration.....: avg=199.69ms min=0s      med=100.93ms max=1m0s     p(90)=518.58ms p(95)=705.6ms
  { expected_response:true }...: avg=195.95ms min=0s      med=101.23ms max=59.89s   p(90)=518.8ms p(95)=705.64ms
http_req_failed.....: 0.14%  ✓ 13664    X 9150788
http_req_receiving.....: avg=7.25ms   min=0s      med=0s      max=2.05s    p(90)=4ms     p(95)=34.52ms
http_req_sending.....: avg=82.04µs  min=0s      med=0s      max=373.56ms p(90)=0s     p(95)=0s
http_req_tls_handshaking.....: avg=0s       min=0s      med=0s      max=0s       p(90)=0s     p(95)=0s
http_req_waiting.....: avg=192.35ms min=0s      med=95.99ms max=1m0s     p(90)=499.99ms p(95)=682.14ms
http_reqs.....: 9164452 484.112248/s
iteration_duration.....: avg=2m22s   min=8.91s  med=2m20s   max=6m34s    p(90)=2m42s   p(95)=2m51s
iterations.....: 12927  0.682869/s
vus.....: 68  min=1  max=100
vus_max.....: 100  min=100  max=100

Running (5h15m30.4s), 000/100 VUs, 12927 complete and 67 interrupted iterations
to fault 1 1 055/100 VUs 5h15m0s
```

JVM

Classic Sawtooth Garbage collection



Stats as of Sept 2023

- 3 full time
- 5 full stack
- 30 Features
- 96 Scenarios
- 5 Environments daily
- ~200 PRs for month
- Avg Runtime: 1 hour 10 minutes
- 6 PR Servers



THANKS!

