Developer Tools #WWDC16

Optimizing Web Content in Your App

Session 420

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Brian Burg Safari and WebKit Engineer

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Web Inspector

Connecting Web Inspector

Profiling Javascript

Analyzing Memory

Connecting Web Inspector

Profiling Javascript

Analyzing Memory

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Connecting Web Inspector

JSContext

HTML
JS
CSS

Introducing Safari View Controller

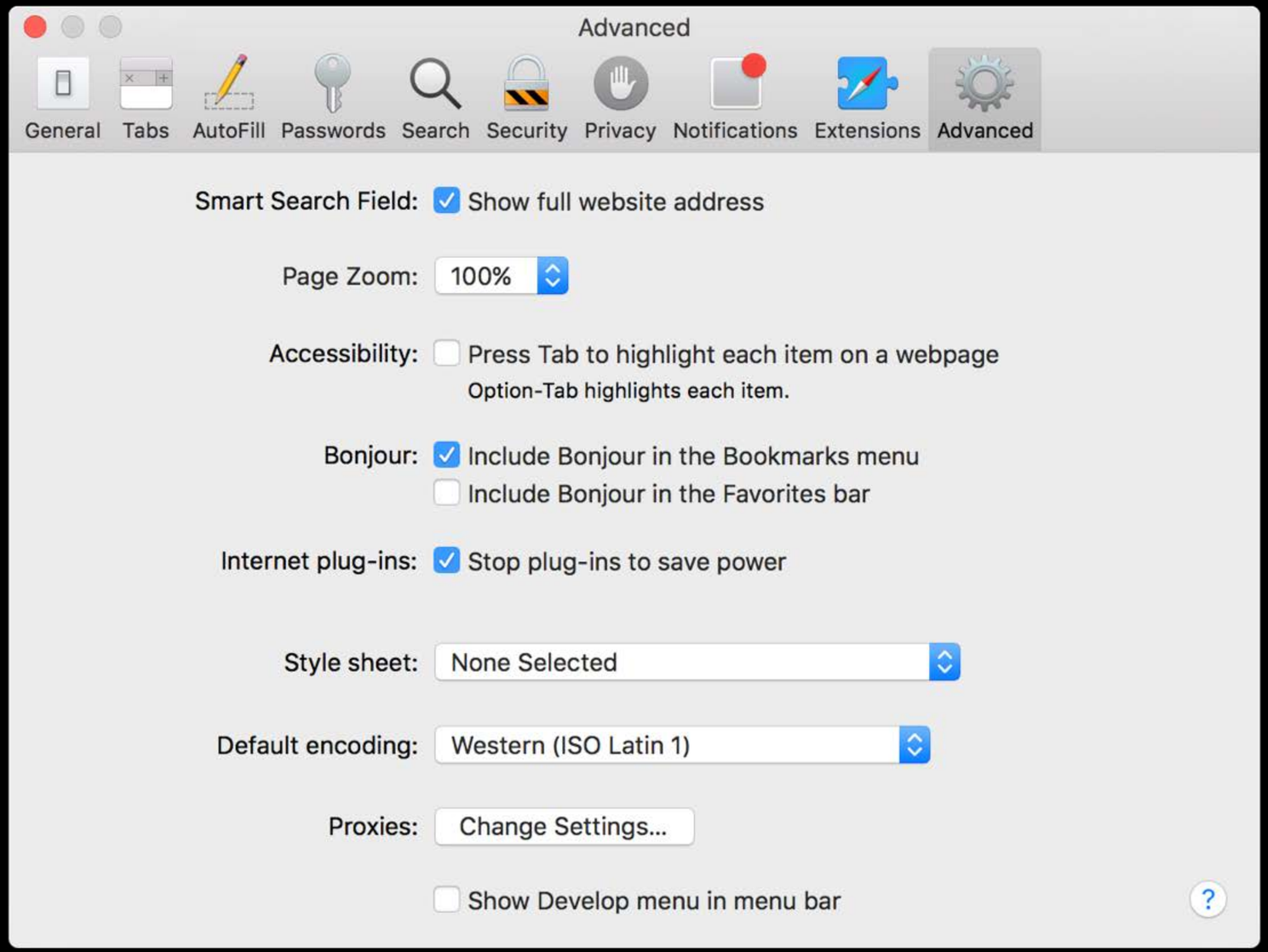
WWDC 2015

WKWebView

Introducing Safari View Controller

WWDC 2014

Web Inspector


Advanced
General
Tabs
AutoFill
Passwords
Search
Security
Privacy
Notifications
Extensions
Advanced
Smart Search Field:
Show full website address
Page Zoom:
100%
Accessibility:
Press Tab to highlight each item on a webpage
Option-Tab highlights each item.
Bonjour:
Include Bonjour in the Bookmarks menu
Include Bonjour in the Favorites bar
Internet plug-ins:
Stop plug-ins to save power
Style sheet:
None Selected
Default encoding:
Western (ISO Latin 1)
Proxies:
Change Settings...
Show Develop menu in menu bar
?

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Show Develop menu in menu bar

?

9:41 AM
100%
Messages
Thursday
16
Calendar
Photos
Camera
Weather
Clock
280
Maps
News
Wallet
Notes
Reminders
Stocks
Videos
iBooks
iTunes Store
App Store
Home
Health
Settings
Phone
Safari
Mail
Music

9:41 AM
100%
Messages
Thursday
16
Calendar
Photos
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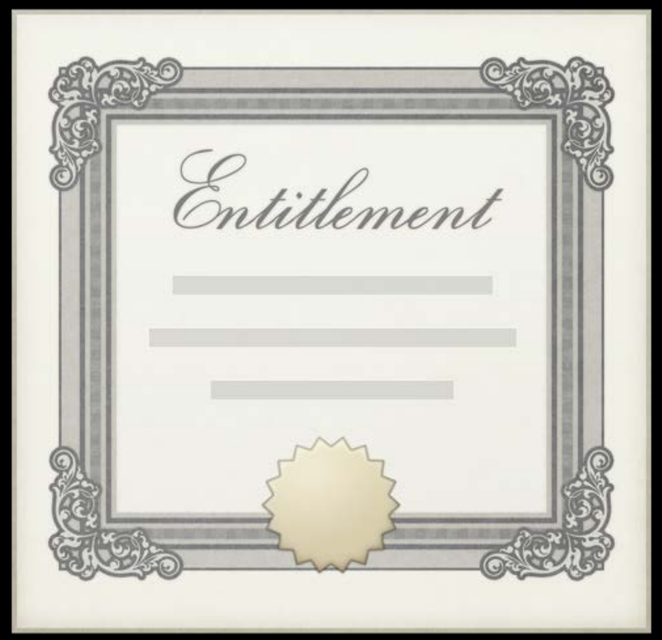
Maps
News
Wallet
Notes
Reminders
Stocks
Videos
iBooks
iTunes Store
App Store
Home
Health
Settings
Phone
Safari
Mail
Music

tory Bookmarks **Develop** Window Help

- Open Page With ▶
- User Agent ▶
- iPhone ▶
- **MacBook Pro** ▶
- Simulator ▶
- Enter Responsive Design Mode ⌥⌘R
- Show Snippet Editor
- Show Extension Builder
- Connect Web Inspector ⌥⇧⌘I
- Show Error Console ⌥⌘C
- Show Page Source ⌥⌘U
- Show Page Resources ⌥⌘A
- Start Timeline Recording ⌥⇧⌘T
- Start Element Selection ⇧⌘C
- Empty Caches ⌥⌘E
- Disable Caches

- Colloquy
  - base.html
  - base.html
  - base.html
  - base.html
- JSPong
  - **Pong Context**
- Automatically Show Web Inspector for JSContexts
- Automatically Pause Connecting to JSContexts



Key	Type	Value
▼ Entitlements File	Dictionary	(1 item)
com.apple.webinspector.allow	Boolean	YES

Web Inspector — MacBook Pro — JSPong — Pong Context

Debugger Paused

Search

Resources | Timelines | Debugger | Console | Search

Pause Reason

Triggered Breakpoint

Call Stack

nextMove — PongAI.js:5

Breakpoints

All Exceptions

All Uncaught Exceptions

PongAI.js

Line 5

Sources

PongAI.js

```
1  var lastBallY = 0;
2
3  function nextMove(paddle, ball)
4  {
5      var ballY = ball.middleY;
6      var ballDirection = ballY > lastBallY
7      ? kUpDirection
8      : kDownDirection;
9      lastBallY = ballY;
10
11     if (ballY > paddle.top)
12         return kUpDirection;
13
14     if (ballY < paddle.bottom)
15         return kDownDirection;
16
17     return ballDirection;
18 }
19
```

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NEW

Sampling Profiler

Profiling JavaScript

Sampling Profiler

Where is the time being spent?

Profiling JavaScript

Sampling Profiler

Where is the time being spent?

Samples the stack every millisecond

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Runs with all four tiers of the JIT compiler

Profiling JavaScript

Sampling Profiler

Where is the time being spent?

Samples the stack every millisecond

Runs with all four tiers of the JIT compiler

Breakpoints and debugger statements are ignored

Up to

30×

JavaScript Profiling Speed Improvement

Profiling JavaScript

Events view

Web Inspector — localhost — demo

11 | 682.5 KB | 36.6ms | 0 | 0 | 0

Search

Elements | Network | Resources | Timelines | Debugger | Storage | Console | Search

Events | Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit

1.00s | 2.00s | 3.00s | 4.00s | 5.00s | 6.00s | 7.00s | 8.00s | 9.00s | 10.00s

JavaScript & Events

Details | Events

Filter Records

Name	Location	Samples	Start Time	Total Time	Self Time	Average Time
Animation Frame Fired	d3.js:2146	7	7.687ms	10.11ms	10.11ms	10.11ms
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Animation Frame Req...	d3_timer_step — d3.js:2156	0	44.01ms	0ms	0ms	0ms
Garbage Collection	—	0	45.74ms	0.738ms	0.738ms	0.738ms
Animation Frame Fired	d3.js:2146	2	57.50ms	2.785ms	2.785ms	2.785ms
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Script Evaluated	d3.geo.projection.js:1	1	142.1ms	3.852ms	3.852ms	3.852ms
Script Evaluated	d3.promise.js:1	1	146.1ms	0.315ms	0.315ms	0.315ms
Script Evaluated	topojson.js:1	0	146.5ms	0.513ms	0.513ms	0.513ms
Script Evaluated	satellite.js:1	1	147.3ms	3.617ms	3.617ms	3.617ms
Script Evaluated	global-map.js:1	0	151.3ms	0.211ms	0.211ms	0.211ms
Script Evaluated	interface.js:1	0	151.6ms	0.203ms	0.203ms	0.203ms
Script Evaluated	demo:16	0	151.9ms	0.118ms	0.118ms	0.118ms
DOM Content Loaded ...	demo:88	4	152.1ms	3.776ms	3.776ms	3.776ms
Script Evaluated	—	0	158.2ms	0.201ms	0.201ms	0.201ms
Progress Event Dispat...	d3.js:1954	0	164.1ms	0.087ms	0.087ms	0.087ms
Load Event Dispatched	d3.js:1940	1	164.2ms	50.68ms	50.68ms	50.68ms
Microtask Dispatched	—	39	166.3ms	48.63ms	48.63ms	48.63ms
Script Evaluated	—	0	216.5ms	0.165ms	0.165ms	0.165ms
Progress Event Dispat...	d3.js:1954	0	227.4ms	0.178ms	0.178ms	0.178ms
Microtask Dispatched	—	0	227.5ms	0.085ms	0.085ms	0.085ms
Load Event Dispatched	d3.js:1940	1	227.6ms	0.707ms	0.707ms	0.707ms
Microtask Dispatched	—	0	227.8ms	0.475ms	0.475ms	0.475ms

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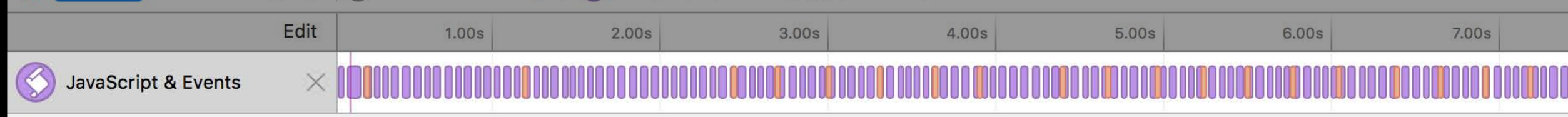

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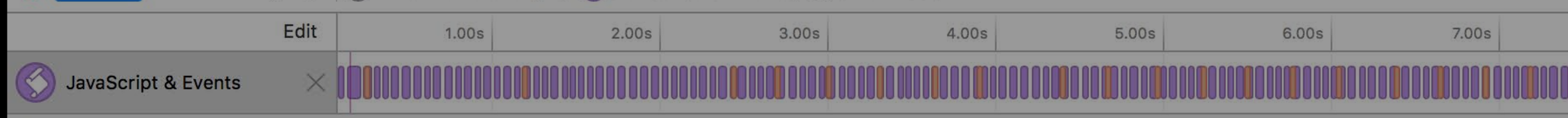

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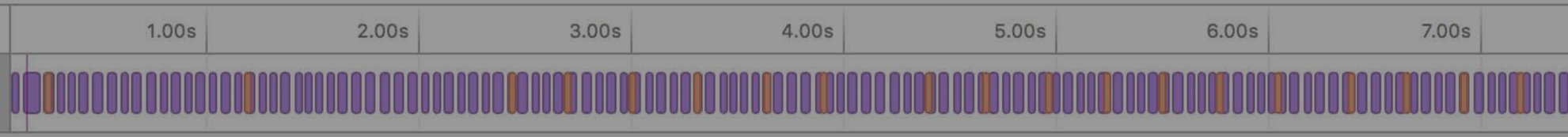
Edit 1.00s 2.00s 3.00s 4.00s 5.00s 6.00s 7.00s



JavaScript & Events

Details > Events

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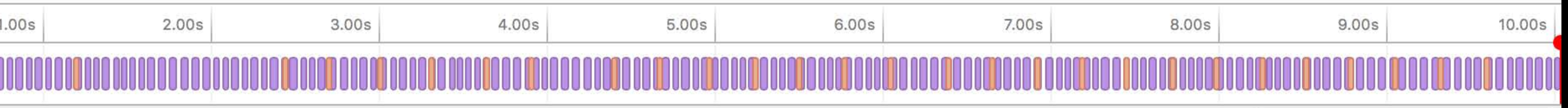

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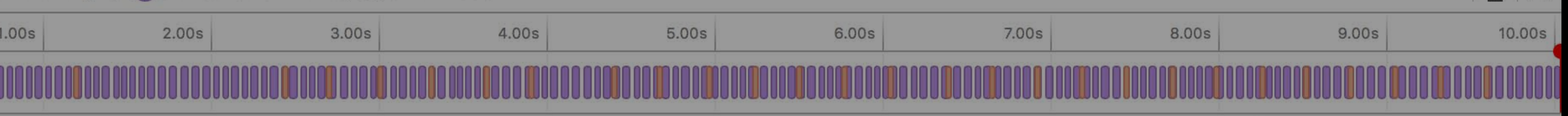

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	0	45.74ms	0.738ms	0.738ms	0.738ms
	2	57.50ms	2.785ms	2.785ms	2.785ms
p — d3.js:2156	0	60.25ms	0ms	0ms	0ms
	2	74.95ms	3.528ms	3.528ms	3.528ms
p — d3.js:2156	0	78.44ms	0ms	0ms	0ms
	2	91.56ms	3.179ms	3.179ms	3.179ms
p — d3.js:2156	0	94.71ms	0ms	0ms	0ms
	2	107.7ms	2.989ms	2.989ms	2.989ms
p — d3.js:2156	0	110.6ms	0ms	0ms	0ms
	4	129.0ms	12.78ms	12.78ms	12.78ms
ction.js:1	1	142.1ms	3.852ms	3.852ms	3.852ms
s:1	1	146.1ms	0.315ms	0.315ms	0.315ms
	0	146.5ms	0.513ms	0.513ms	0.513ms
	1	147.3ms	3.617ms	3.617ms	3.617ms
s:1	0	151.3ms	0.211ms	0.211ms	0.211ms
	0	151.6ms	0.203ms	0.203ms	0.203ms
	0	151.9ms	0.118ms	0.118ms	0.118ms
	4	152.1ms	3.776ms	3.776ms	3.776ms

Profiling JavaScript

Events view

NEW

Profiling JavaScript

Call Trees view

Web Inspector — localhost — demo

12 709.3 KB 69.2ms 0 0 0

Timelines | Elements | Network | Resources | Debugger

Events | Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s

JavaScript & Events

Details | Events

Name	Location	Samples	Start Time	Total Time	Self Time
Animation Frame ...	d3.js:2146	14	0.804ms	18.77ms	18.77ms
Animation Frame ...	d3_timer_step — d3.js:2156	0	19.55ms	0ms	0ms
Garbage Collection	—	0	21.41ms	0.866ms	0.866ms
Script Evaluated	d3.js:1	4	34.40ms	15.18ms	15.18ms
Script Evaluated	d3.geo.projection.js:1	2	50.13ms	4.164ms	4.164ms
Script Evaluated	d3.promise.js:1	0	54.36ms	0.251ms	0.251ms
Script Evaluated	topojson.js:1	1	54.78ms	0.551ms	0.551ms
Script Evaluated	satellite.js:1	1	55.46ms	3.436ms	3.436ms
Script Evaluated	flat-map.js:1	0	59.10ms	0.346ms	0.346ms
Script Evaluated	globe-map.js:1	0	59.70ms	0.445ms	0.445ms
Script Evaluated	interface.js:1	0	60.18ms	0.252ms	0.252ms
Script Evaluated	demo:17	0	60.46ms	0.131ms	0.131ms
DOM Content Lo...	demo:95	6	60.72ms	7.666ms	7.666ms
Animation Frame ...	d3_timer — d3.js:2142	0	67.07ms	0ms	0ms
Script Evaluated	—	0	71.89ms	0.171ms	0.171ms
Progress Event D...	d3.js:1954	0	77.51ms	0.080ms	0.080ms
Progress Event D...	d3.js:1954	0	77.64ms	0.013ms	0.013ms

Web Inspector — localhost — demo

12 709.3 KB 69.2ms 0 0 0

Timelines | Elements | Network | Resources | Debugger

Events | Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s

JavaScript & Events

Details | Events | ✓ Call Trees | Filter Re

Name	Location	Samples	Start Time	Total Time	Self Time
Animation Frame ...	d3.js:2146	14	0.804ms	18.77ms	18.77ms
Animation Frame ...	d3_timer_step — d3.js:2156	0	19.55ms	0ms	0ms
Garbage Collection	—	0	21.41ms	0.866ms	0.866ms
Script Evaluated	d3.js:1	4	34.40ms	15.18ms	15.18ms
Script Evaluated	d3.geo.projection.js:1	2	50.13ms	4.164ms	4.164ms
Script Evaluated	d3.promise.js:1	0	54.36ms	0.251ms	0.251ms
Script Evaluated	topojson.js:1	1	54.78ms	0.551ms	0.551ms
Script Evaluated	satellite.js:1	1	55.46ms	3.436ms	3.436ms
Script Evaluated	flat-map.js:1	0	59.10ms	0.346ms	0.346ms
Script Evaluated	globe-map.js:1	0	59.70ms	0.445ms	0.445ms
Script Evaluated	interface.js:1	0	60.18ms	0.252ms	0.252ms
Script Evaluated	demo:17	0	60.46ms	0.131ms	0.131ms
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Web Inspector — localhost — demo

12 709.3 KB 69.2ms 0 0 0

Timelines | Elements | Network | Resources | Debugger

Events | Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s

JavaScript & Events

Details | Call Trees | Top Down | Bottom Up | Filter Re

Total Time		Self Time	Function
450.2ms	82.3%	0.0ms	d3_timer_step d3.js
449.0ms	82.1%	1.2ms	d3_timer_mark d3.js
446.7ms	81.6%	0.0ms	(anonymous function) flat-map.js
446.7ms	81.6%	2.7ms	_drawForegroundScene flat-map.js
221.6ms	40.5%	15.2ms	_drawSatellites flat-map.js
141.3ms	25.8%	22.7ms	_drawUnlessClipped flat-map.js
94.8ms	17.3%	0.0ms	stream d3.js
93.5ms	17.1%	1.3ms	d3_geo_streamGeometry d3.js
92.2ms	16.8%	1.2ms	Point d3.js
91.0ms	16.6%	1.4ms	(anonymous function) d3.js
89.6ms	16.4%	0.0ms	point d3.js
89.6ms	16.4%	1.6ms	point d3.js
88.0ms	16.1%	0.0ms	drawLabelAtPoint flat-map.js
78.6ms	14.4%	78.6ms	fillText
9.4ms	1.7%	2.8ms	scale d3.js
1.3ms	0.2%	1.3ms	hasOwnProperty
23.8ms	4.4%	0.0ms	stream d3.js

Total Time		Self Time	Function
450.2ms	82.3%	0.0ms	d3_timer_step d3.js
449.0ms	82.1%	1.2ms	d3_timer_mark d3.js
446.7ms	81.6%	0.0ms	(anonymous function) flat-map.js
446.7ms	81.6%	2.7ms	_drawForegroundScene flat-map.js
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94.8ms	17.3%	0.0ms	stream d3.js
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91.0ms	16.6%	1.4ms	(anonymous function) d3.js
89.6ms	16.4%	0.0ms	point d3.js
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88.0ms	16.1%	0.0ms	drawLabelAtPoint flat-map.js
78.6ms	14.4%	78.6ms	fillText
9.4ms	1.7%	2.8ms	scale d3.js
1.3ms	0.2%	1.3ms	hasOwnProperty
23.8ms	4.4%	0.0ms	stream d3.js
50.9ms	9.3%	0.0ms	path d3.js
8.9ms	1.6%	3.2ms	map
3.7ms	0.7%	3.7ms	fill
1.7ms	0.3%	1.7ms	beginPath
167.7ms	30.6%	76.5ms	_plotSatellites flat-map.js
44.8ms	8.2%	2.5ms	_plotSolarTerminator flat-map.js
5.3ms	1.0%	2.7ms	_drawTime flat-map.js
3.3ms	0.6%	3.3ms	clearRect
1.2ms	0.2%	1.2ms	Date
1.2ms	0.2%	0.0ms	tick d3.js
1.1ms	0.2%	1.1ms	requestAnimationFrame

Total Time		Self Time	Function
450.2ms	82.3%	0.0ms	▼ f d3_timer_step d3.js
449.0ms	82.1%	1.2ms	▼ f d3_timer_mark d3.js
446.7ms	81.6%	0.0ms	▼ f (anonymous function) flat-map.js
446.7ms	81.6%	2.7ms	▼ f _drawForegroundScene flat-map.js
221.6ms	40.5%	15.2ms	▼ f _drawSatellites flat-map.js
141.3ms	25.8%	22.7ms	▼ f _drawUnlessClipped flat-map.js
94.8ms	17.3%	0.0ms	▼ f stream d3.js
93.5ms	17.1%	1.3ms	▼ f d3_geo_streamGeometry d3.js
92.2ms	16.8%	1.2ms	▼ f Point d3.js
91.0ms	16.6%	1.4ms	▼ f (anonymous function) d3.js
89.6ms	16.4%	0.0ms	▼ f point d3.js
89.6ms	16.4%	1.6ms	▼ f point d3.js
88.0ms	16.1%	0.0ms	▼ f drawLabelAtPoint flat-map.js
78.6ms	14.4%	78.6ms	N fillText
9.4ms	1.7%	2.8ms	▶ f scale d3.js
1.3ms	0.2%	1.3ms	N hasOwnProperty
23.8ms	4.4%	0.0ms	▶ f stream d3.js ➔
50.9ms	9.3%	0.0ms	▶ f path d3.js
8.9ms	1.6%	3.2ms	▶ N map
3.7ms	0.7%	3.7ms	N fill
1.7ms	0.3%	1.7ms	N beginPath
167.7ms	30.6%	76.5ms	▶ f _plotSatellites flat-map.js
44.8ms	8.2%	2.5ms	▶ f _plotSolarTerminator flat-map.js
5.3ms	1.0%	2.7ms	▶ f _drawTime flat-map.js
3.3ms	0.6%	3.3ms	N clearRect
1.2ms	0.2%	1.2ms	N Date
1.2ms	0.2%	0.0ms	▶ f tick d3.js
1.1ms	0.2%	1.1ms	N requestAnimationFrame

Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s | 2.00s

ot & Events

Call Trees | Top Down | Bottom Up | Filter Records

ime	Self Time	Function
82.3%	0.0ms	d3_timer_step d3.js
82.1%	1.2ms	d3_timer_mark d3.js
81.6%	0.0ms	(anonymous function) flat-map.js
81.6%	2.7ms	_drawForegroundScene flat-map.js
40.5%	15.2ms	_drawSatellites flat-map.js
25.8%	22.7ms	_drawUnlessClipped flat-map.js
17.3%	0.0ms	stream d3.js
17.1%	1.3ms	d3_geo_streamGeometry d3.js
16.8%	1.2ms	Point d3.js
16.6%	1.4ms	(anonymous function) d3.js
16.4%	0.0ms	point d3.js
16.4%	1.6ms	point d3.js
16.1%	0.0ms	drawLabelAtPoint flat-map.js
14.4%	78.6ms	fillText
1.7%	2.8ms	scale d3.js
0.2%	1.3ms	hasOwnProperty
4.4%	0.0ms	stream d3.js
9.3%	0.0ms	path d3.js
1.6%	3.2ms	map
0.7%	3.7ms	fill
0.3%	1.7ms	beginPath
30.6%	76.5ms	_plotSatellites flat-map.js

Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

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81.6%	0.0ms	(anonymous function) flat-map.js
81.6%	2.7ms	_drawForegroundScene flat-map.js
40.5%	15.2ms	_drawSatellites flat-map.js
25.8%	22.7ms	_drawUnlessClipped flat-map.js
17.3%	0.0ms	stream d3.js
17.1%	1.3ms	d3_geo_streamGeometry d3.js
16.8%	1.2ms	Point d3.js
16.6%	1.4ms	(anonymous function) d3.js
16.4%	0.0ms	point d3.js
16.4%	1.6ms	point d3.js
16.1%	0.0ms	drawLabelAtPoint flat-map.js
14.4%	78.6ms	fillText
1.7%	2.8ms	scale d3.js
0.2%	1.3ms	hasOwnProperty
4.4%	0.0ms	stream d3.js
9.3%	0.0ms	path d3.js
1.6%	3.2ms	map
0.7%	3.7ms	fill
0.3%	1.7ms	beginPath
30.6%	76.5ms	_plotSatellites flat-map.js

Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s | 2.00s

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Call Trees | Top Down | Bottom Up | Filter Records

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81.6%	0.0ms	(anonymous function) flat-map.js
81.6%	2.7ms	_drawForegroundScene flat-map.js
40.5%	15.2ms	_drawSatellites flat-map.js
25.8%	22.7ms	_drawUnlessClipped flat-map.js
17.3%	0.0ms	stream d3.js
17.1%	1.3ms	d3_geo_streamGeometry d3.js
16.8%	1.2ms	Point d3.js
16.6%	1.4ms	(anonymous function) d3.js
16.4%	0.0ms	point d3.js
16.4%	1.6ms	point d3.js
16.1%	0.0ms	drawLabelAtPoint flat-map.js
14.4%	78.6ms	fillText
1.7%	2.8ms	scale d3.js
0.2%	1.3ms	hasOwnProperty
4.4%	0.0ms	stream d3.js
9.3%	0.0ms	path d3.js
1.6%	3.2ms	map
0.7%	3.7ms	fill
0.3%	1.7ms	beginPath
30.6%	76.5ms	_plotSatellites flat-map.js

Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s | 2.00s

ot & Events

Call Trees | Top Down | Bottom Up | Filter Records

ime	Self Time	Function
14.4%	78.6ms	fillText
14.0%	76.5ms	_plotSatellites flat-map.js
7.3%	39.7ms	atan2
6.3%	34.3ms	moveTo
4.1%	22.7ms	_drawUnlessClipped flat-map.js
3.1%	16.8ms	_drawSatellites flat-map.js
2.9%	16.1ms	(anonymous function) dspace.js
2.1%	11.5ms	arc
2.0%	11.2ms	arrayIteratorValueNext
2.0%	11.0ms	(anonymous function) eci-to-geodetic.js
1.8%	10.0ms	(anonymous function) sgp4.js
1.6%	8.6ms	resampleRecursive d3.js
1.4%	7.4ms	(anonymous function) d3.js
1.2%	6.5ms	d3_geo_clipAntimeridianLine d3.js
1.1%	5.9ms	values
1.0%	5.4ms	d3_map_escape d3.js
0.8%	4.4ms	push
0.7%	4.0ms	asin
0.7%	3.9ms	resampleLineTo d3.js
0.7%	3.8ms	(program) d3.js
0.7%	3.8ms	setProperty
0.7%	3.8ms	(anonymous function) d3.js

Events | Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

Edit | 200.0ms | 400.0ms | 600.0ms | 800.0ms | 1.00s | 1.20s | 1.40s | 1.60s | 1.80s

JavaScript & Events

Details | Call Trees | Top Down | Bottom Up | Filter Re

Total Time		Self Time	Function
78.6ms	14.4%	78.6ms	fillText
76.5ms	14.0%	76.5ms	_plotSatellites flat-map.js
39.7ms	7.3%	39.7ms	atan2
34.3ms	6.3%	34.3ms	moveTo
22.7ms	4.1%	22.7ms	_drawUnlessClipped flat-map.js
16.8ms	3.1%	16.8ms	_drawSatellites flat-map.js
16.1ms	2.9%	16.1ms	(anonymous function) dspace.js
11.5ms	2.1%	11.5ms	arc
11.2ms	2.0%	11.2ms	arrayIteratorValueNext
11.0ms	2.0%	11.0ms	(anonymous function) eci-to-geodetic.js
10.0ms	1.8%	10.0ms	(anonymous function) sgp4.js
8.6ms	1.6%	8.6ms	resampleRecursive d3.js
7.4ms	1.4%	7.4ms	(anonymous function) d3.js
6.5ms	1.2%	6.5ms	d3_geo_clipAntimeridianLine d3.js
5.9ms	1.1%	5.9ms	values
5.4ms	1.0%	5.4ms	d3_map_escape d3.js
4.4ms	0.8%	4.4ms	push
4.0ms	0.7%	4.0ms	asin
3.9ms	0.7%	3.9ms	resampleLineTo d3.js
3.8ms	0.7%	3.8ms	(program) d3.js
3.8ms	0.7%	3.8ms	setProperty
3.8ms	0.7%	3.8ms	(anonymous function) d3.js

Events | Frames | Timeline Recording 1 | JavaScript & Events | 0ms – 15.00s

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JavaScript & Events

Details | Call Trees | Top Down | Bottom Up | Filter Re

Total Time		Self Time	Function
78.6ms	14.4%	78.6ms	▼ N fillText
78.6ms	14.4%	0.0ms	▼ f drawLabelAtPoint flat-map.js
78.6ms	14.4%	0.0ms	▼ f point d3.js
78.6ms	14.4%	0.0ms	▼ f point d3.js
78.6ms	14.4%	0.0ms	▼ f (anonymous function) d3.js
78.6ms	14.4%	0.0ms	▼ f Point d3.js
78.6ms	14.4%	0.0ms	▼ f d3_geo_streamGeometry d3.js
78.6ms	14.4%	0.0ms	▼ f stream d3.js
78.6ms	14.4%	0.0ms	▼ f _drawUnlessClipped flat-map.js
78.6ms	14.4%	0.0ms	▼ f _drawSatellites flat-map.js
78.6ms	14.4%	0.0ms	▼ f _drawForegroundScene flat-map.js
78.6ms	14.4%	0.0ms	▼ f (anonymous function) flat-map.js
78.6ms	14.4%	0.0ms	▼ f d3_timer_mark d3.js
78.6ms	14.4%	0.0ms	f d3_timer_step d3.js
76.5ms	14.0%	76.5ms	▶ f _plotSatellites flat-map.js
39.7ms	7.3%	39.7ms	▶ N atan2
34.3ms	6.3%	34.3ms	▶ N moveTo
22.7ms	4.1%	22.7ms	▶ f _drawUnlessClipped flat-map.js
16.8ms	3.1%	16.8ms	▶ f _drawSatellites flat-map.js
16.1ms	2.9%	16.1ms	▶ f (anonymous function) dspace.js
11.5ms	2.1%	11.5ms	▶ N arc
11.2ms	2.0%	11.2ms	▶ N arrayIteratorValueNext

Demo

JavaScript profiling

Brian Burg
Safari and WebKit Engineer

Profiling JavaScript

Summary

Profiling so fast it's accurate

Profiling JavaScript

Summary

Profiling so fast it's accurate

Find slow handlers with the Events view

Profiling JavaScript

Summary

Profiling so fast it's accurate

Find slow handlers with the Events view

See time costs pile up in the Call Trees view

Profiling JavaScript

Summary

Profiling so fast it's accurate

Find slow handlers with the Events view

See time costs pile up in the Call Trees view

Bottom Up view shows the best places to start optimizing

Connecting Web Inspector

Profiling Javascript

Analyzing Memory

Connecting Web Inspector

Profiling Javascript

Analyzing Memory

NEW

Analyzing Memory

Memory timeline

Web Inspector — webkit.org — memory-debugging-with-web-inspector

25 2.94 MB 1.71s 0 0 0

Search

Timelines | Elements | Network | Resources | Debugger | Console

Events | Frames

Timeline Recording 1 | 0ms – 15.00s

Edit

1.00s 2.00s 3.00s 4.00s 5.00s 6.00s 7.00s 8.00s

Network Requests

Layout & Rendering

JavaScript & Events

Overview

Filter Records

Name

2.00s 4.00s 6.00s 8.00s 10.00s 12.00s 14.00s

Web Inspector — webkit.org — memory-debugging-wi

25 2.94 MB 1.71s 0 0

Timelines | Elements | Network | Resources

Events | Frames | Timeline Recording 1 | 0ms – 15.00s

Edit

1.00s 2.00s 3.00s 4.00s

Network Requests

Layout & Rendering

JavaScript & Events

Overview

Name

2.00s 4.00s 6.00s 8.0

Web Inspector — webkit.org — memory-debugging-wi

25 2.94 MB 1.71s 0 0

Timelines Elements Network Resources

Events Frames Timeline Recording 1 0ms – 15.00s

Edit

1.00s 2.00s 3.00s 4.00s

Network Requests

Layout & Rendering

JavaScript & Events

Overview

Name 2.00s 4.00s 6.00s 8.0

Web Inspector — webkit.org — memory-debugging-wi

25 2.94 MB 1.71s 0 0

Timelines Elements Network Resources

Events Frames Timeline Recording 1 0ms – 15.00s

Edit

1.00s 2.00s 3.00s 4.00s

Network Requests

Layout & Rendering

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Overview

Name 2.00s 4.00s 6.00s 8.0

Web Inspector — webkit.org — memory-debugging-wi

25 2.94 MB 1.71s 0 0

Timelines Elements Network Resources

Events Frames Timeline Recording 1 0ms – 15.00s

Done

1.00s 2.00s 3.00s 4.00s

- Network Requests
- Layout & Rendering
- JavaScript & Events
- Memory
- JavaScript Allocations

Timelines | Elements | Network | Resources

Events | Frames | Timeline Recording 1 | 0ms – 15.00s

Done

1.00s | 2.00s | 3.00s | 4.00s

- Network Requests
- Layout & Rendering
- JavaScript & Events
- Memory
- JavaScript Allocations

Timelines | Elements | Network | Resources

Events | Frames | Timeline Recording 1 | 0ms – 15.00s

Done

1.00s | 2.00s | 3.00s | 4.00s

- [ ] Network Requests
- [ ] Layout & Rendering
- [ ] JavaScript & Events
- [x] Memory
- [x] JavaScript Allocations

Timelines | Elements | Network | Resources

Events | Frames | Timeline Recording 1 | 0ms – 15.00s

Done

1.00s | 2.00s | 3.00s | 4.00s

- Network Requests
- Layout & Rendering
- JavaScript & Events
- Memory
- JavaScript Allocations

Web Inspector — webkit.org — memory-debugging-with-web-inspector

17 2.38 MB 898ms 0 0 0

Search

Timelines | Elements | Network | Resources | Debugger | Console

Events | Frames | Timeline Recording 1 | Memory | Entire Recording

Edit

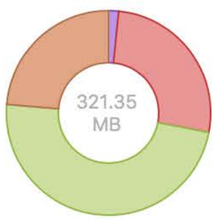
5.00s 10.00s 15.00s 20.00s 25.00s 30.00s 35.00s

Memory

Maximum Size: 395.96 MB

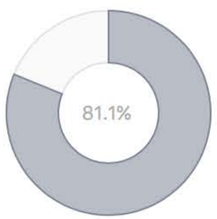
Details

Breakdown



- JavaScript 5.12 MB
- Images 85.07 MB
- Layers 155.06 MB
- Page 76.09 MB

Max Comparison



- Maximum 395.96 MB
- Current 321.35 MB

Categories

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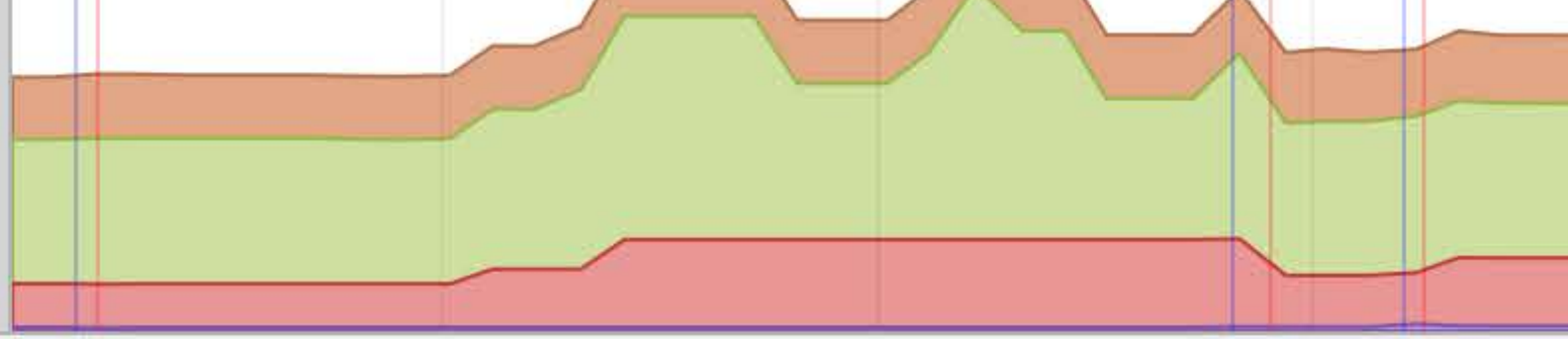
Page
Highest: 76.19 MB
Lowest: 60.16 MB

Layers
Highest: 245.83 MB
Lowest: 136.57 MB

Images
Highest: 95.55 MB
Lowest: 42.15 MB

JavaScript
Highest: 6.95 MB
Lowest: 3.53 MB



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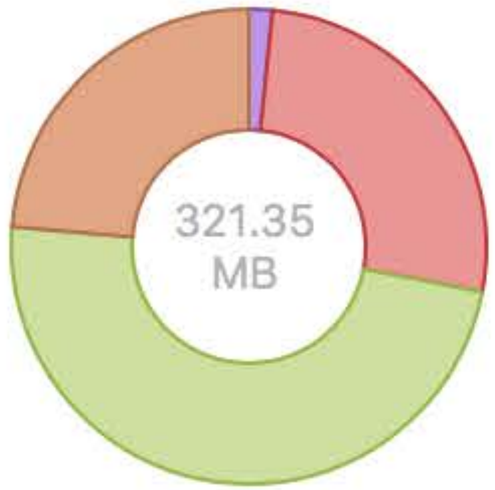

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- Images
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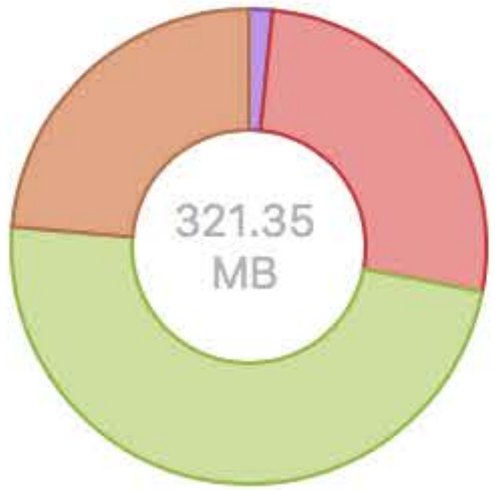

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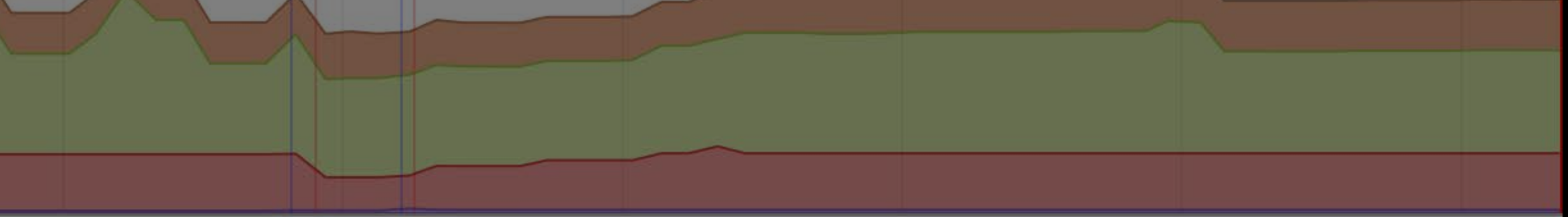

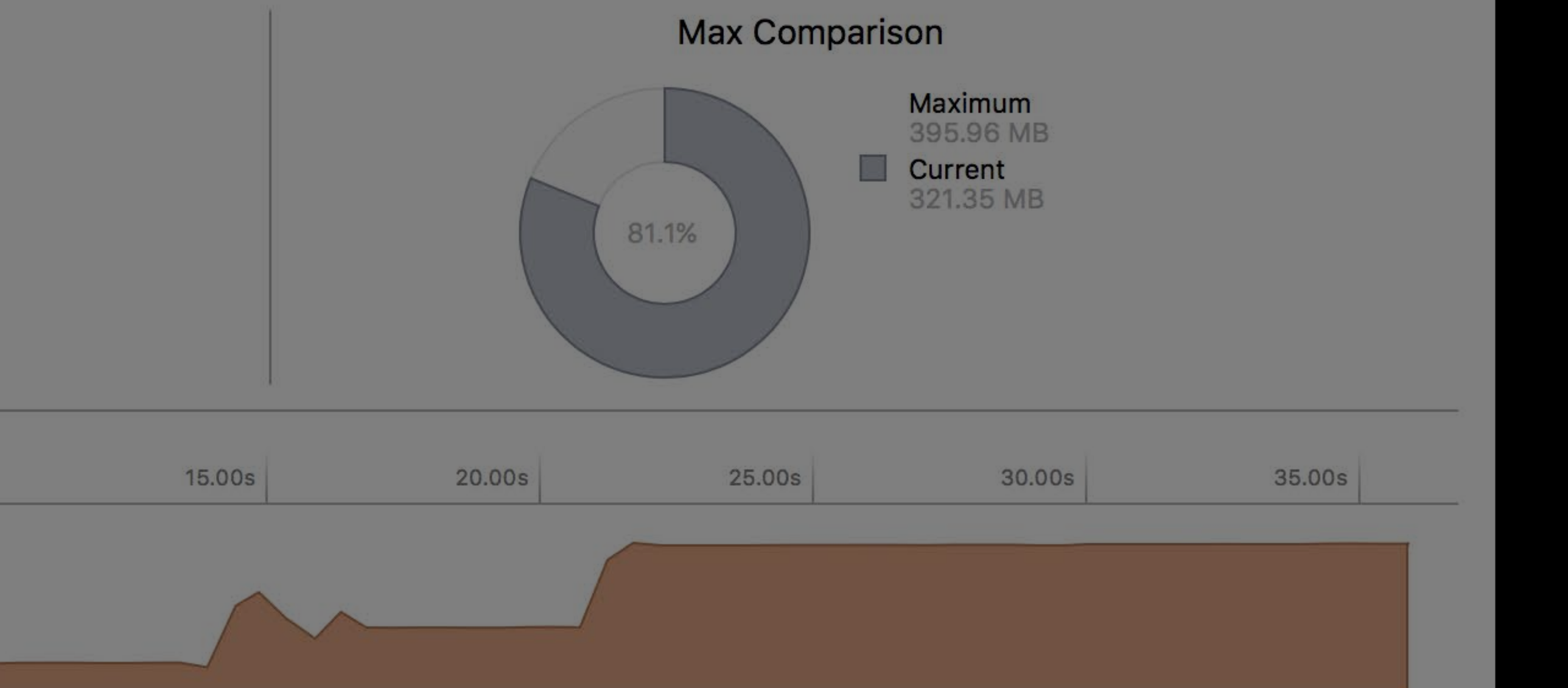
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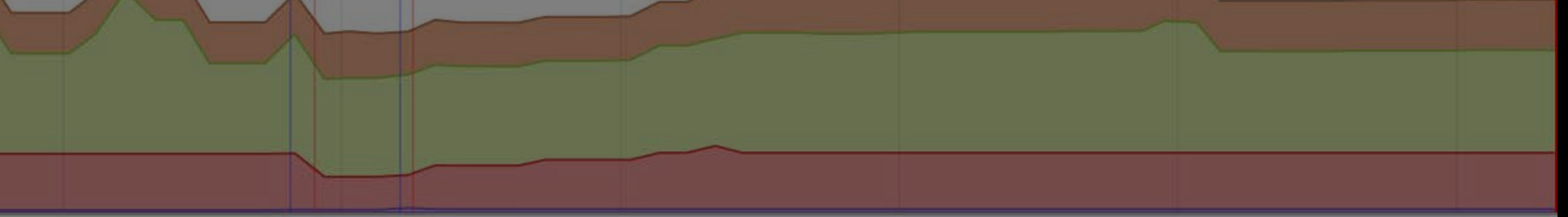

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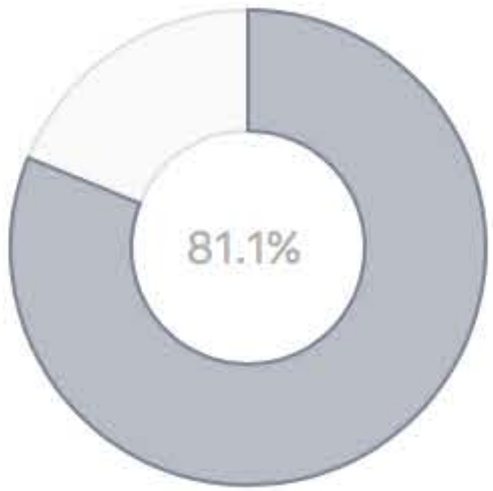

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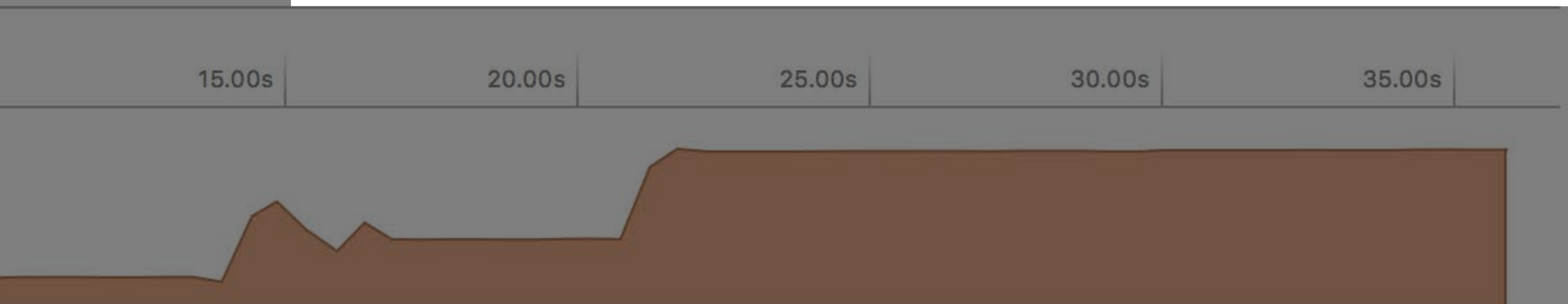

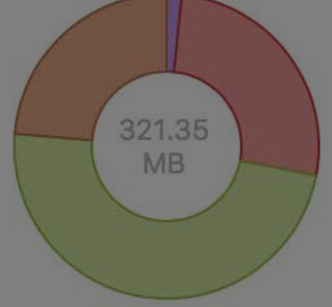

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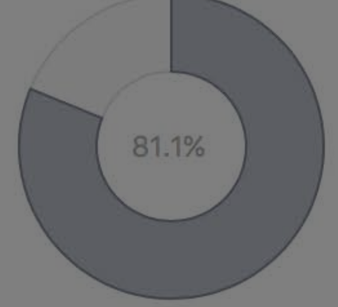

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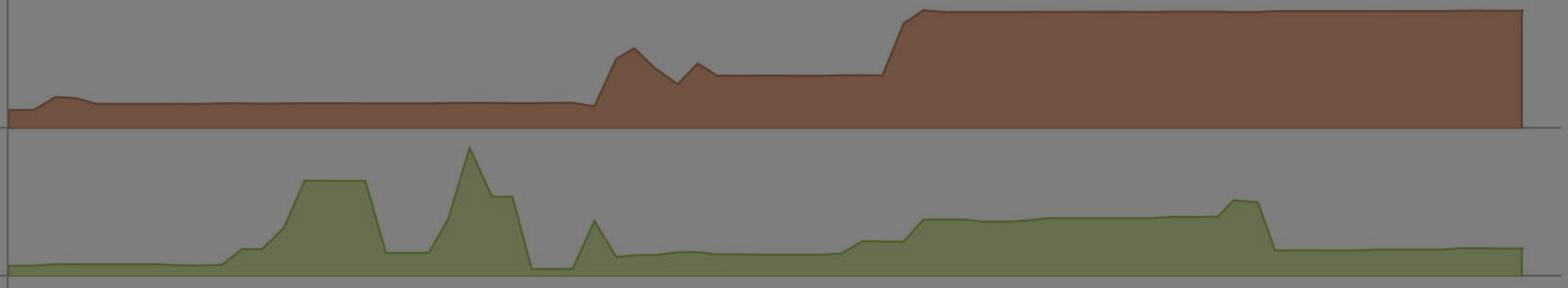

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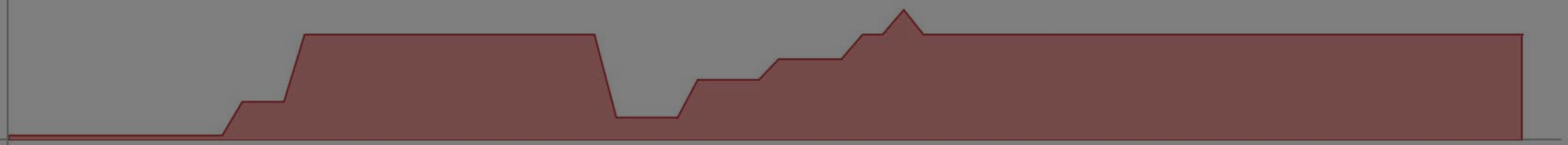

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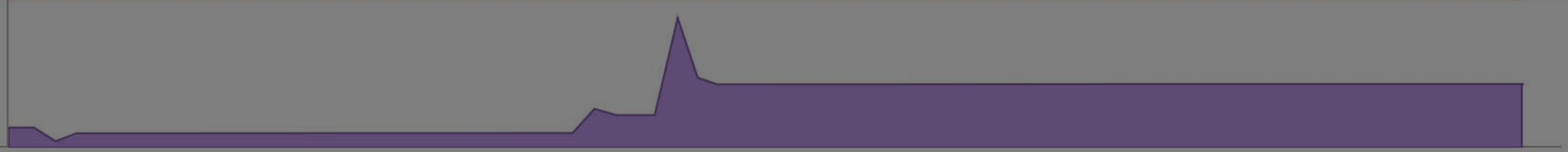

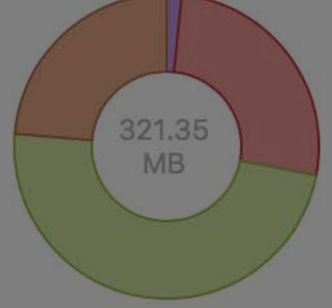

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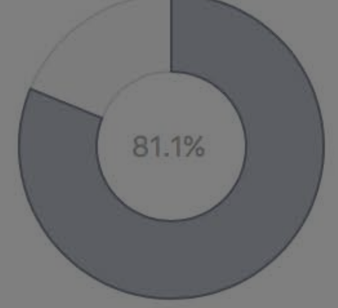

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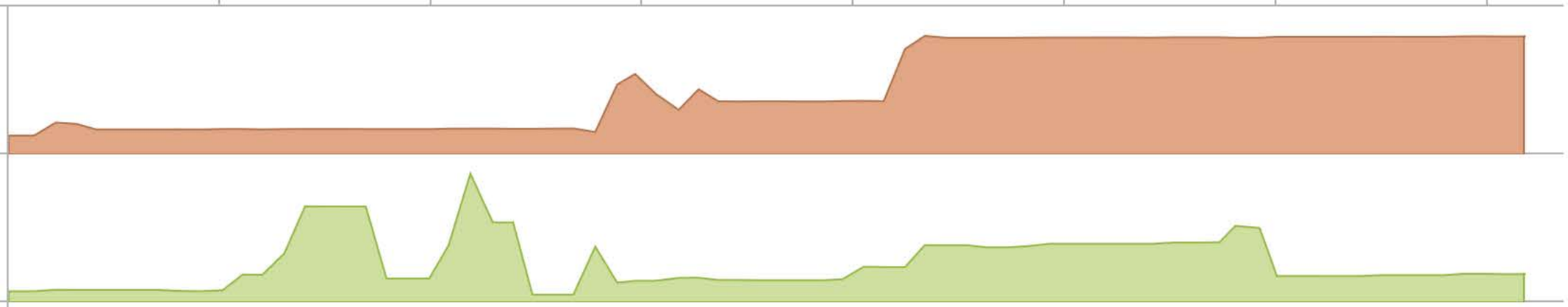

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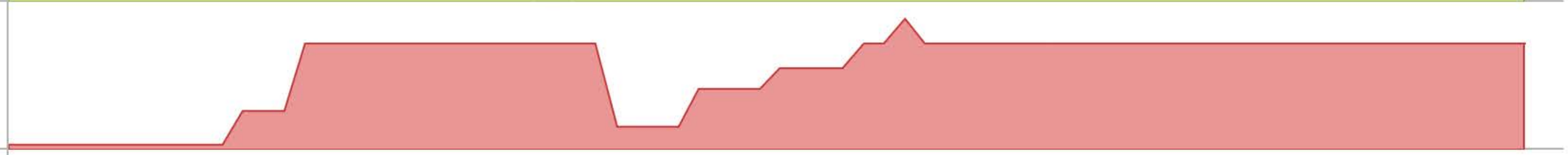

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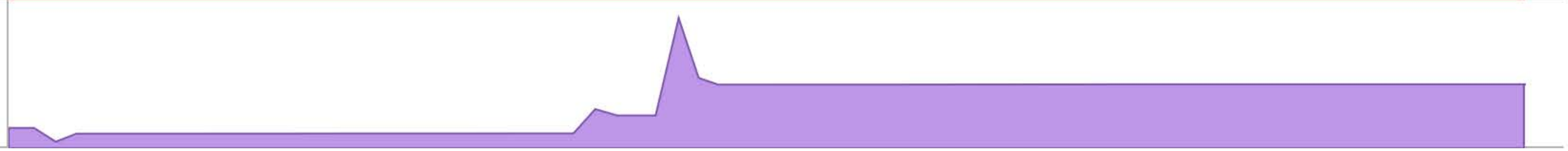

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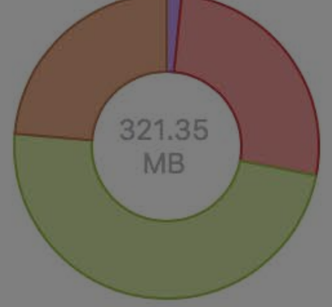

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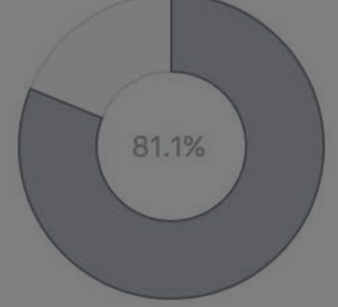

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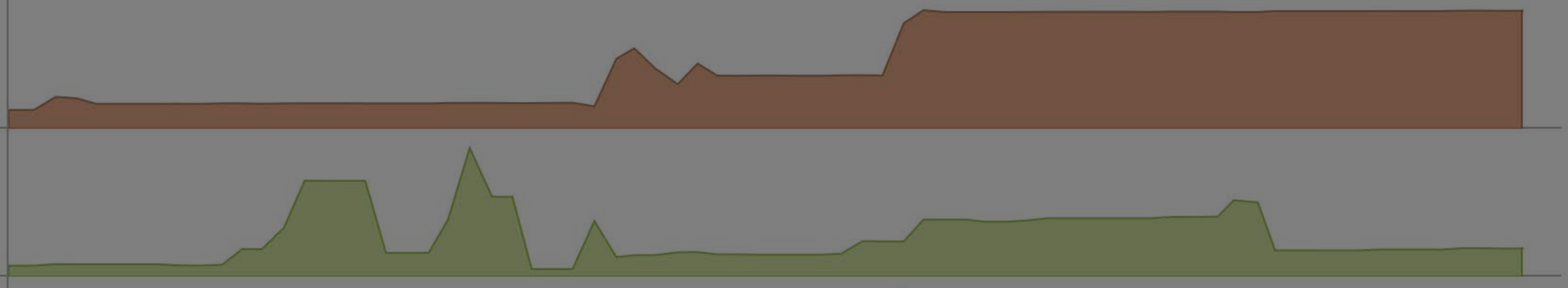

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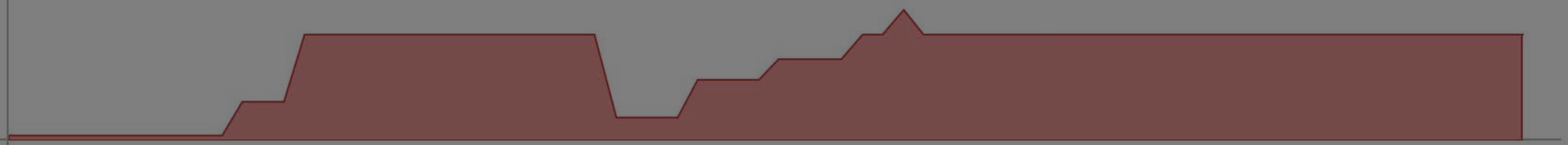

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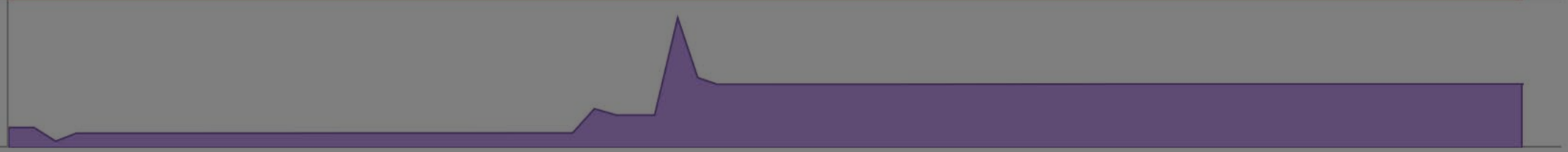

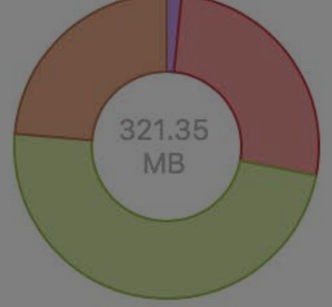

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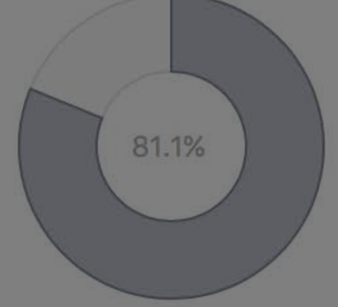

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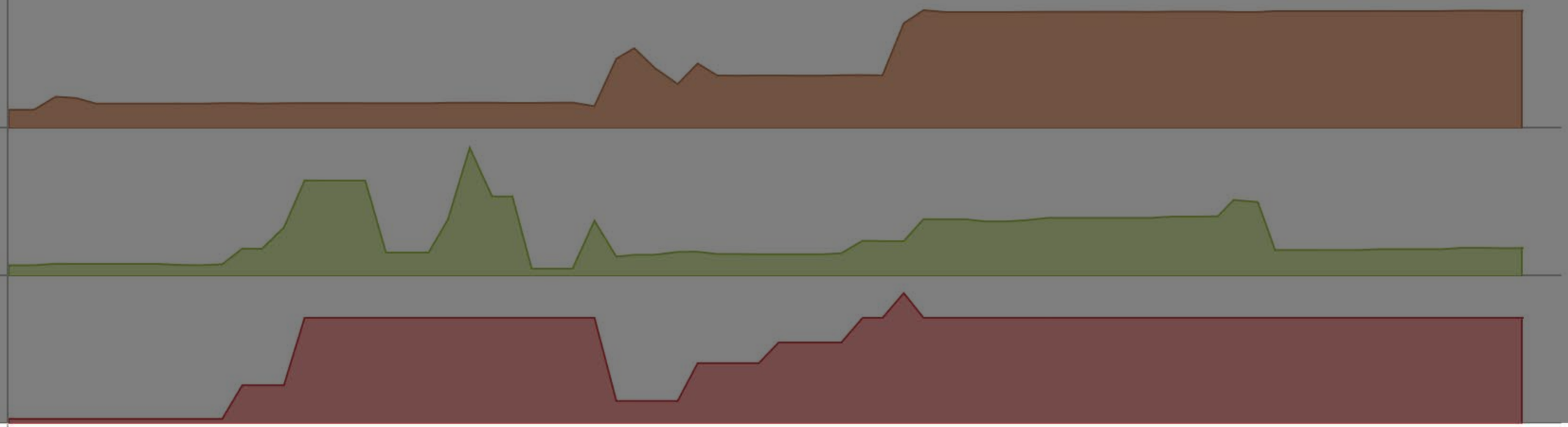

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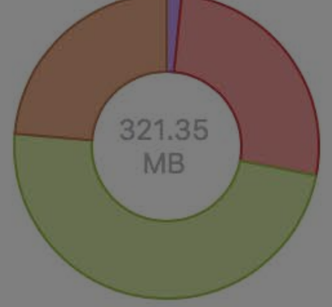

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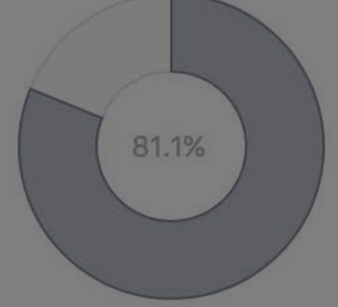

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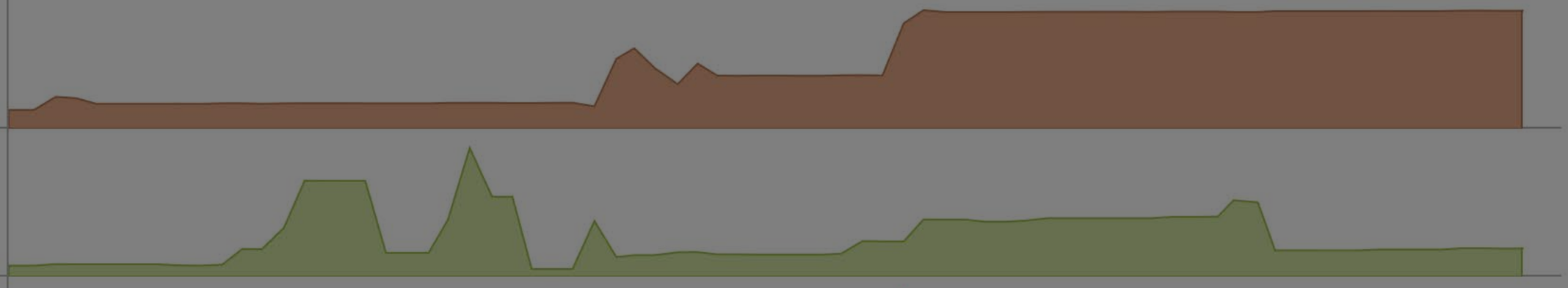

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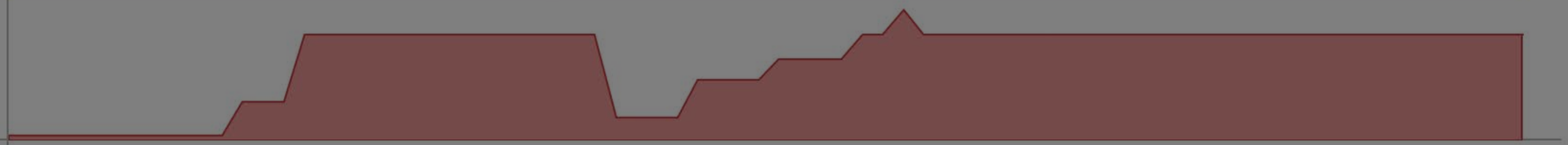

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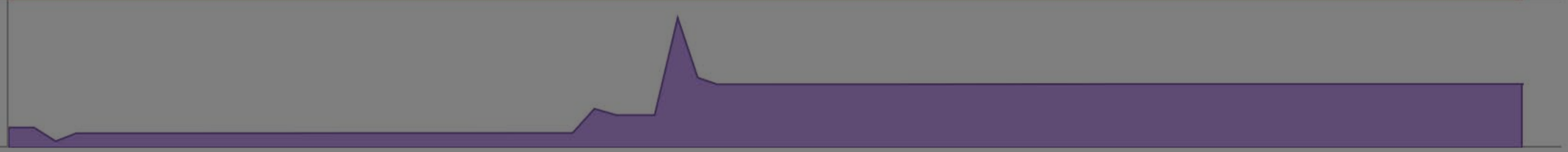

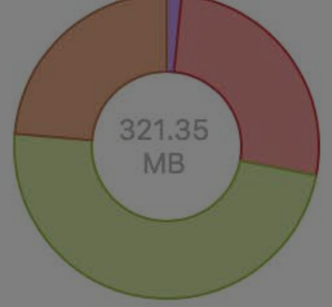

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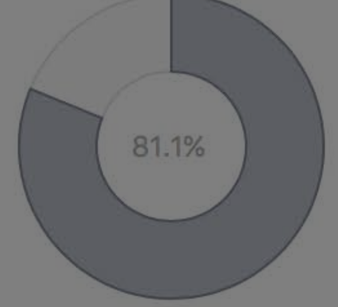

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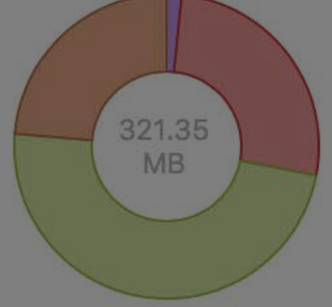

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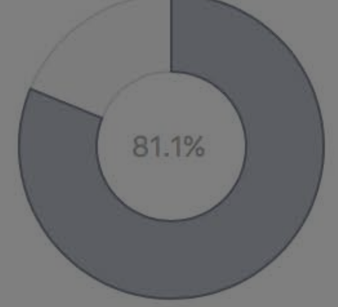

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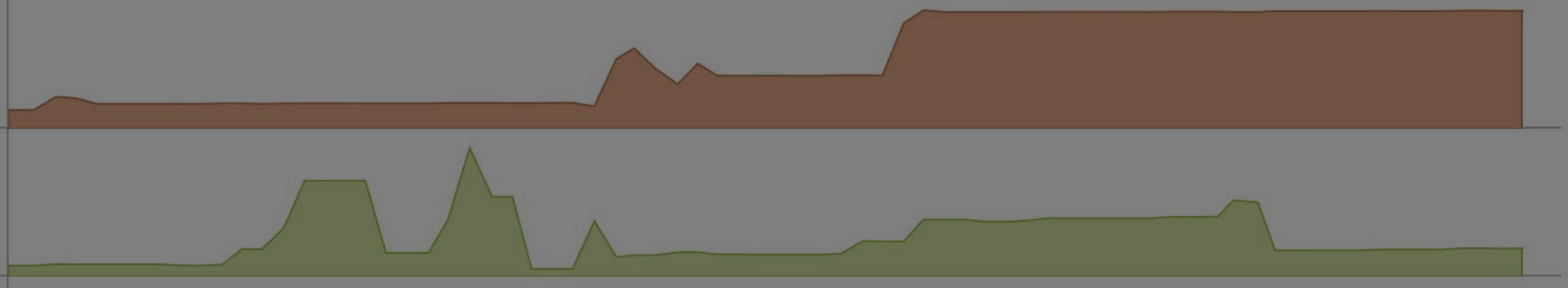

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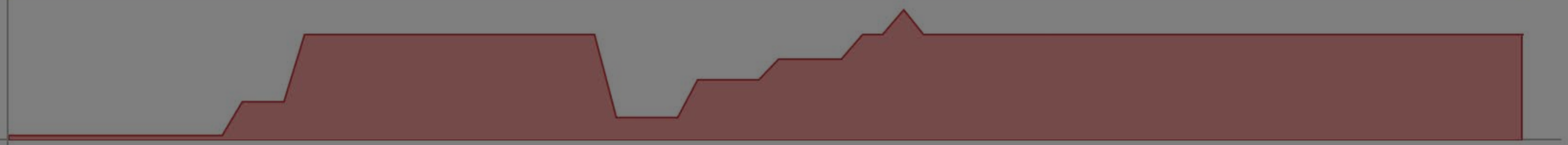

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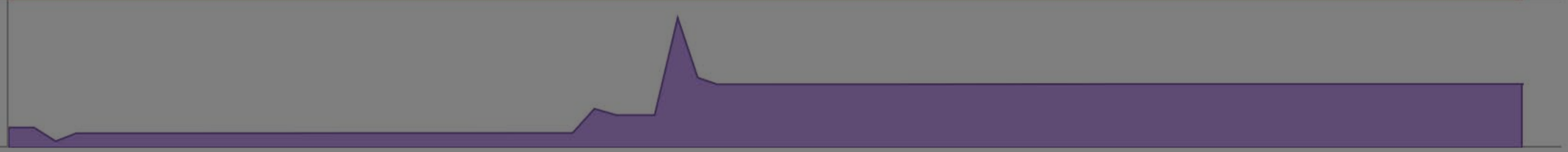

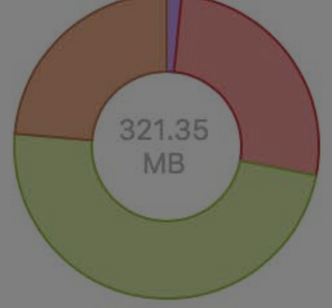

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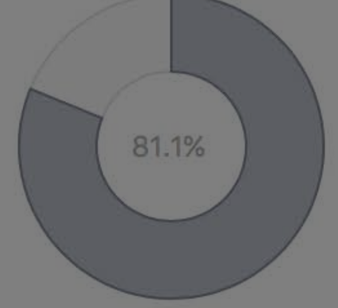

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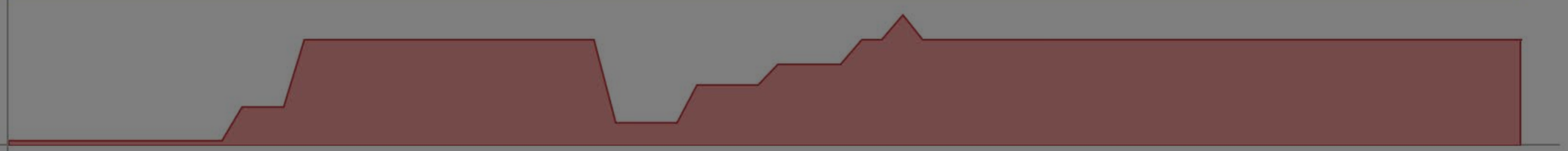

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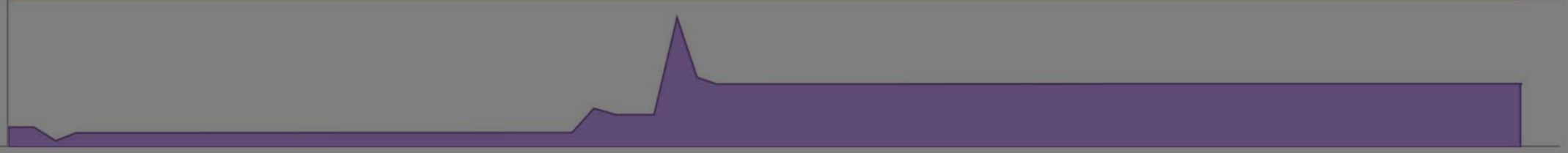
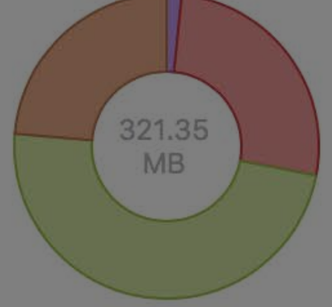


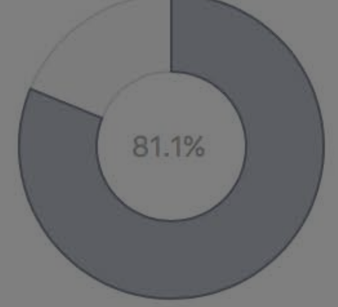


JavaScript
5.12 MB

Images
85.07 MB

Layers
155.06 MB

Page
76.09 MB



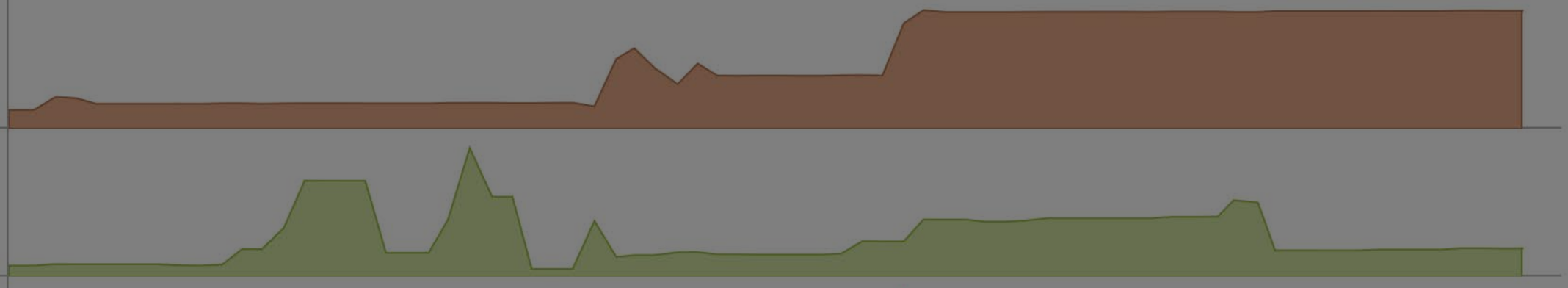
Maximum
395.96 MB

Current
321.35 MB

Categories

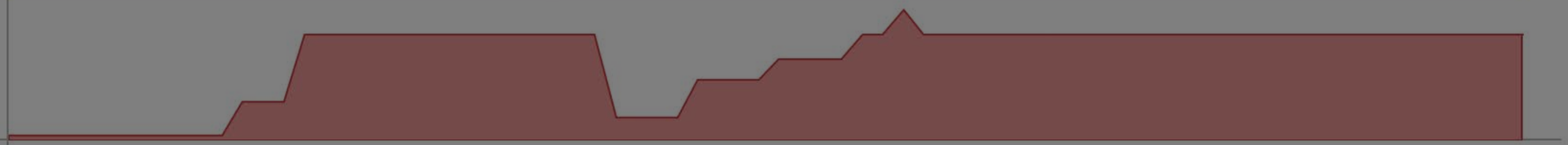
5.00s 10.00s 15.00s 20.00s 25.00s 30.00s 35.00s

Page
Highest: 76.19 MB
Lowest: 60.16 MB

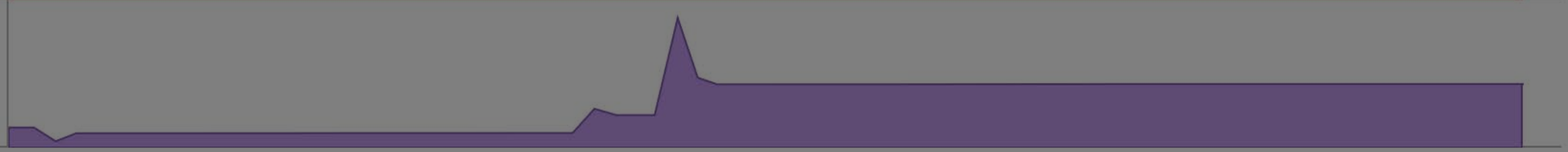


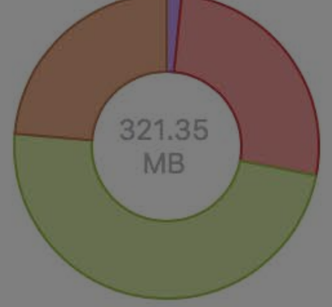
Layers
Highest: 245.83 MB
Lowest: 136.57 MB

Images
Highest: 95.55 MB
Lowest: 42.15 MB



JavaScript
Highest: 6.95 MB
Lowest: 3.53 MB





JavaScript
5.12 MB

Images
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Layers
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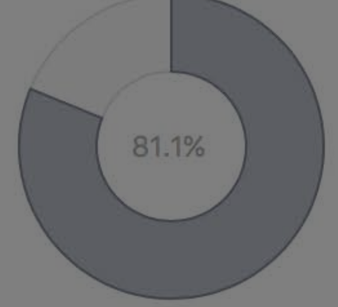
Page
76.09 MB



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Categories

5.00s 10.00s 15.00s 20.00s 25.00s 30.00s 35.00s

Page
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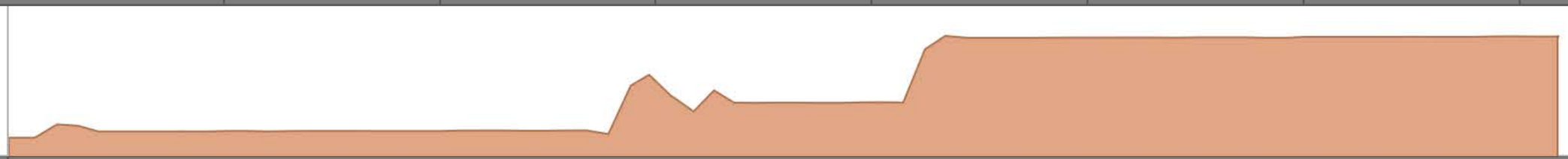
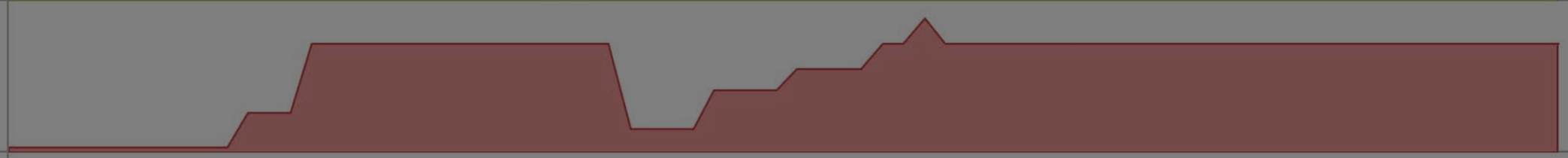
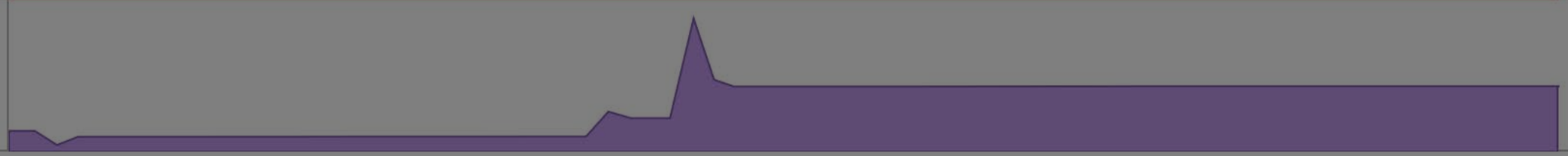


Layers
Highest: 245.83 MB
Lowest: 136.57 MB

Images
Highest: 95.55 MB
Lowest: 42.15 MB



JavaScript
Highest: 6.95 MB
Lowest: 3.53 MB



Web Inspector — webkit.org — memory-debugging-with-web-inspector

17 2.38 MB 898ms 0 0 0

Search

Timelines | Elements | Network | Resources | Debugger | Console

Events | Frames | Timeline Recording 1 | Memory | Entire Recording

Edit

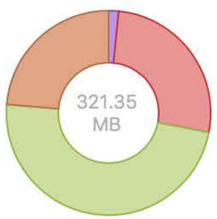
5.00s 10.00s 15.00s 20.00s 25.00s 30.00s 35.00s

Memory

Maximum Size: 395.96 MB

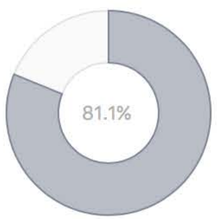
Details

Breakdown



- JavaScript 5.12 MB
- Images 85.07 MB
- Layers 155.06 MB
- Page 76.09 MB

Max Comparison



- Maximum 395.96 MB
- Current 321.35 MB

Categories

5.00s 10.00s 15.00s 20.00s 25.00s 30.00s 35.00s

Page
Highest: 76.19 MB
Lowest: 60.16 MB

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Highest: 245.83 MB
Lowest: 136.57 MB

Images
Highest: 95.55 MB
Lowest: 42.15 MB

JavaScript
Highest: 6.95 MB
Lowest: 3.53 MB

Analyzing Memory

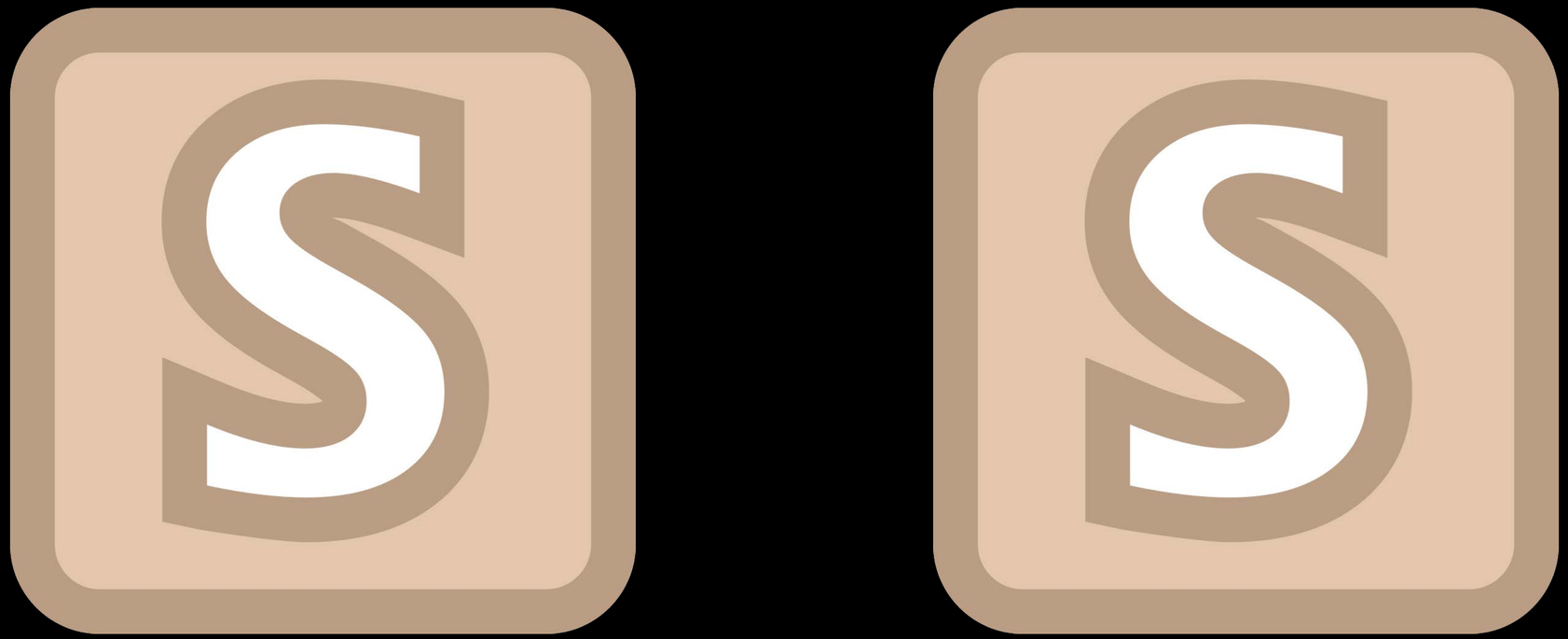
Memory timeline

NEW

Analyzing Memory

JavaScript Allocations timeline

JavaScript Allocation Snapshots



JavaScript Allocation Snapshots

Web Inspector — localhost — demo

17 856.7 KB 134ms 6 0 0

Search

Timelines | Elements | Network | Resources | Debugger | Console

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit

10.00s 20.00s 30.00s 40.00s 50.00s 60.00s 70.00s

JavaScript Allocations

Details | Snapshot List

Filter Records

Name	Time	Size
Snapshot 1	23.21ms	9.54 MB
Snapshot 2	10.05s	13.65 MB
Snapshot 3	20.13s	14.01 MB
Snapshot 4	30.06s	14.05 MB
Snapshot 5	40.06s	14.03 MB
Snapshot 6	50.18s	14.03 MB
Snapshot 7	60.08s	14.03 MB
Snapshot 8	70.05s	18.13 MB
Snapshot 9	80.09s	18.11 MB
Snapshot 10	90.06s	18.11 MB
Snapshot 11	100.08s	18.12 MB
Snapshot 12	110.06s	18.13 MB
Snapshot 13	120.15s	18.19 MB
Snapshot 14	126.91s	18.28 MB

Web Inspector — localhost — demo

17 856.7 KB 134ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 7

JavaScript Allocations

Details | Snapshot List | Filter Recor

Name	Time
Snapshot 1	23.21ms
Snapshot 2	10.05s
Snapshot 3	20.13s
Snapshot 4	30.06s
Snapshot 5	40.06s
Snapshot 6	50.18s
Snapshot 7	60.08s
Snapshot 8	70.05s
Snapshot 9	80.09s
Snapshot 10	90.06s
Snapshot 11	100.08s
Snapshot 12	110.06s
Snapshot 13	120.15s
Snapshot 14	126.91s

Web Inspector — localhost — demo

17 856.7 KB 134ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 > JavaScript Allocations > Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 7

JavaScript Allocations

Details > Snapshot List | Filter Recor

Name	Time
Snapshot 1	23.21ms
Snapshot 2	10.05s
Snapshot 3	20.13s
Snapshot 4	30.06s
Snapshot 5	40.06s
Snapshot 6	50.18s
Snapshot 7	60.08s
Snapshot 8	70.05s
Snapshot 9	80.09s
Snapshot 10	90.06s
Snapshot 11	100.08s
Snapshot 12	110.06s
Snapshot 13	120.15s
Snapshot 14	126.91s

Web Inspector — localhost — demo

17 856.7 KB 134ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit

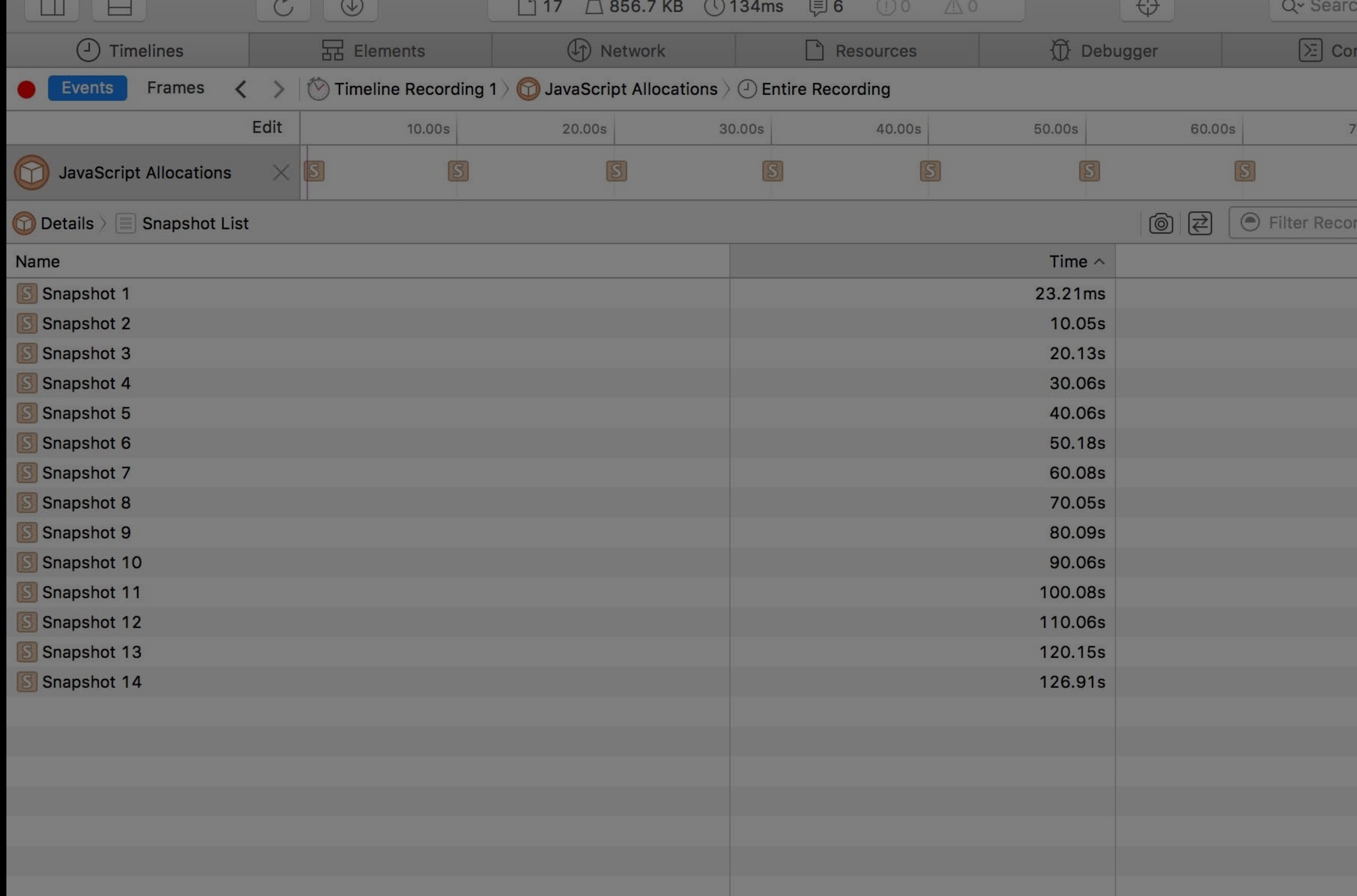
10.00s 20.00s 30.00s 40.00s 50.00s 60.00s 7

JavaScript Allocations

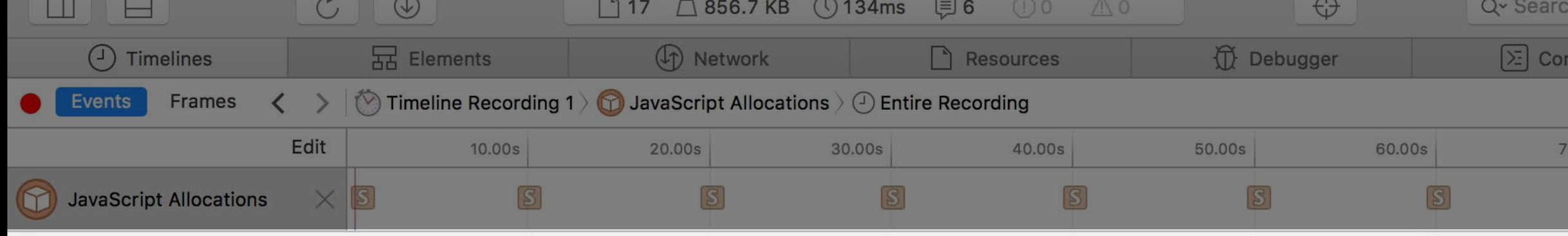
Details | Snapshot List

Filter Recor

Name	Time
Snapshot 1	23.21ms
Snapshot 2	10.05s
Snapshot 3	20.13s
Snapshot 4	30.06s
Snapshot 5	40.06s
Snapshot 6	50.18s
Snapshot 7	60.08s
Snapshot 8	70.05s
Snapshot 9	80.09s
Snapshot 10	90.06s
Snapshot 11	100.08s
Snapshot 12	110.06s
Snapshot 13	120.15s
Snapshot 14	126.91s



Name	Time
Snapshot 1	23.21ms
Snapshot 2	10.05s
Snapshot 3	20.13s
Snapshot 4	30.06s
Snapshot 5	40.06s
Snapshot 6	50.18s
Snapshot 7	60.08s
Snapshot 8	70.05s
Snapshot 9	80.09s
Snapshot 10	90.06s
Snapshot 11	100.08s
Snapshot 12	110.06s
Snapshot 13	120.15s
Snapshot 14	126.91s



Details › Snapshot List

Filter Recor

Name	Time
Snapshot 1	23.21ms
Snapshot 2	10.05s
Snapshot 3	20.13s
Snapshot 4	30.06s
Snapshot 5	40.06s
Snapshot 6	50.18s
Snapshot 7	60.08s
Snapshot 8	70.05s
Snapshot 9	80.09s
Snapshot 10	90.06s
Snapshot 11	100.08s
Snapshot 12	110.06s
Snapshot 13	120.15s
Snapshot 14	126.91s

17 856.7 KB 134ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s

JavaScript Allocations

Details | Snapshot List | Filter Recor

Name	Time
Snapshot 1	23.21ms
Snapshot 2	10.05s
Snapshot 3	20.13s
Snapshot 4	30.06s
Snapshot 5	40.06s
Snapshot 6	50.18s
Snapshot 7	60.08s
Snapshot 8	70.05s
Snapshot 9	80.09s
Snapshot 10	90.06s
Snapshot 11	100.08s
Snapshot 12	110.06s
Snapshot 13	120.15s
Snapshot 14	126.91s

NEW

```
console.takeHeapSnapshot("Before login");

// Do some work
...

console.takeHeapSnapshot("After login");
```

NEW

```
console.takeHeapSnapshot("Before login");

// Do some work
...

console.takeHeapSnapshot("After login");
```

NEW

```
for (let entry of list) {
    console.takeHeapSnapshot(entry.name);
    // Do some more work
    ...
}
```

NEW

```
for (let entry of list) {
    console.takeHeapSnapshot(entry.name);
    // Do some more work
    ...
}
```

Analyzing Memory

console.takeHeapSnapshot()

Snapshots can impact performance

Analyzing Memory

console.takeHeapSnapshot()

Snapshots can impact performance

Use in pairs around code doing work

Analyzing Memory

console.takeHeapSnapshot()

Snapshots can impact performance

Use in pairs around code doing work

Don't leave in console.takeHeapSnapshot()

Web Inspector — localhost — demo

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.00

JavaScript Allocations

Details | Snapshot List | Filter Recor

Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s

Web Inspector — localhost — demo

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

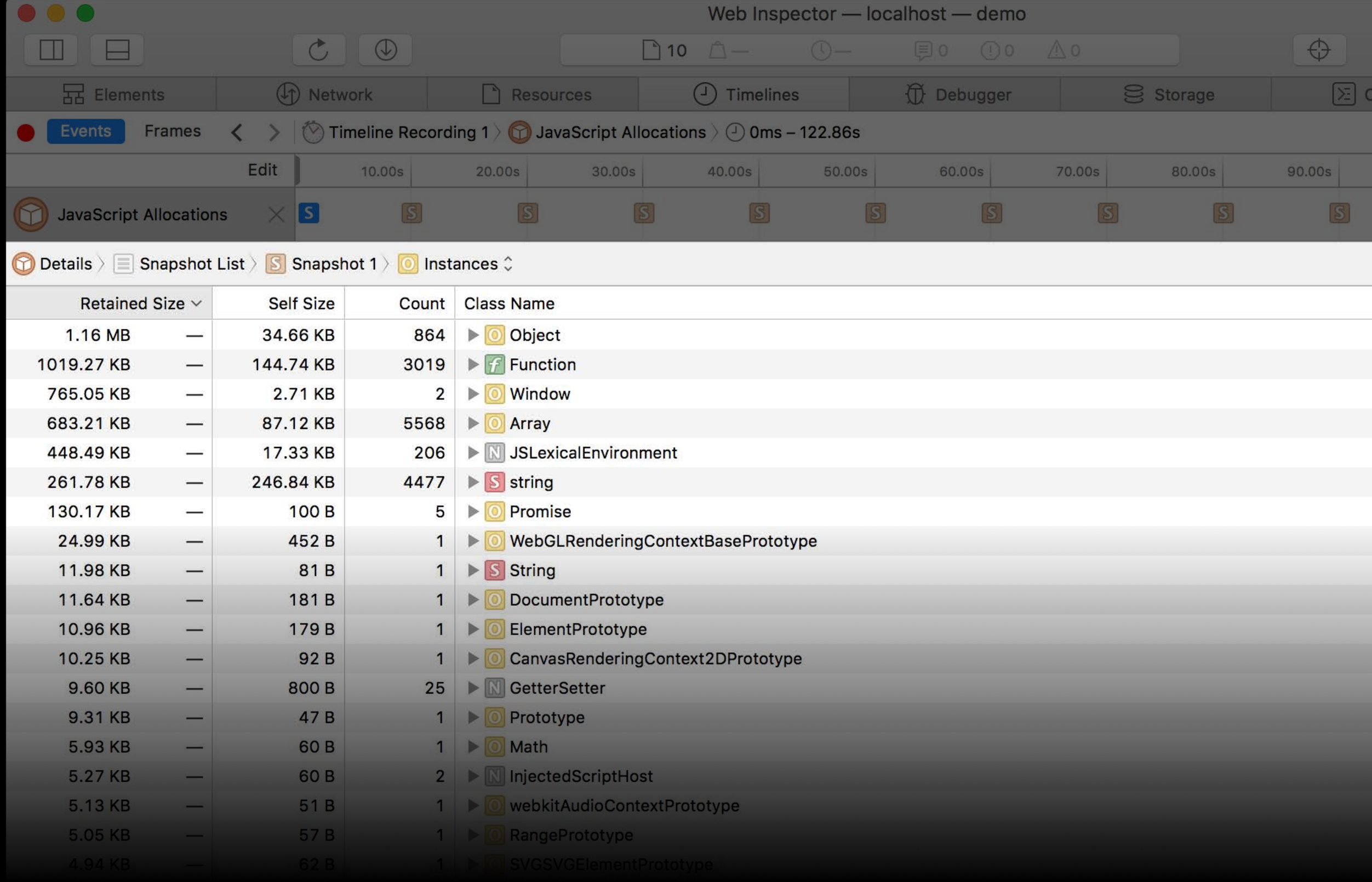
Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.00

JavaScript Allocations

Details | Snapshot List | Filter Recor

Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s



Retained Size		Self Size	Count	Class Name
1.16 MB	—	34.66 KB	864	Object
1019.27 KB	—	144.74 KB	3019	Function
765.05 KB	—	2.71 KB	2	Window
683.21 KB	—	87.12 KB	5568	Array
448.49 KB	—	17.33 KB	206	JSLexicalEnvironment
261.78 KB	—	246.84 KB	4477	string
130.17 KB	—	100 B	5	Promise
24.99 KB	—	452 B	1	WebGLRenderingContextBasePrototype
11.98 KB	—	81 B	1	String
11.64 KB	—	181 B	1	DocumentPrototype
10.96 KB	—	179 B	1	ElementPrototype
10.25 KB	—	92 B	1	CanvasRenderingContext2DPrototype
9.60 KB	—	800 B	25	GetterSetter
9.31 KB	—	47 B	1	Prototype
5.93 KB	—	60 B	1	Math
5.27 KB	—	60 B	2	InjectedScriptHost
5.13 KB	—	51 B	1	webkitAudioContextPrototype
5.05 KB	—	57 B	1	RangePrototype
4.94 KB	—	62 B	1	SVGSVGElementPrototype

Web Inspector — localhost — demo

Elements | Network | Resources | Timelines | Debugger | Storage

Events | Frames | Timeline Recording 1 | JavaScript Allocations | 0ms – 122.86s

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s

JavaScript Allocations

Details | Snapshot List | Snapshot 1 | Object Graph

Retained Size		Self Size	Class Name
764.48 KB	40.5%	2.68 KB	@202770 Window "http://localhost:8888/demo/"
142.68 KB	7.6%	114 B	d3: Object @203546 {version: "3.5.17", ascending: function, descending: function, min: function, max
33.60 KB	1.8%	144 B	satellite: Object @203544 {version: "1.2.0", constants: Object, degreesLat: function, degreesLong: func
11.98 KB	0.6%	81 B	String @203742 String {length: 0}
10.21 KB	0.5%	82 B	Array @203707 [] (0)
9.70 KB	0.5%	66 B	topojson: Object @203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, merg
9.31 KB	0.5%	47 B	Prototype @203771 TypedArray {Symbol(Symbol.toStringTag): undefined}
5.93 KB	0.3%	60 B	Math: Math @203548 Math {E: 2.718281828459045, LN2: 0.6931471805599453, LN10: 2.302585092994046, LOG
5.61 KB	0.3%	32 B	Reflect: Object @203569 {}
5.61 KB	0.3%	32 B	["PrivateSymbol.Reflect"]: Object @203569 {}
3.95 KB	0.2%	37 B	console: Console @203541 Console {debug: function, error: function, log: function, info: function, wa
2.78 KB	0.1%	31 B	Map @203747 Map {Symbol(Symbol.toStringTag): "Map"}
2.22 KB	0.1%	44 B	Function @202816 function Object
2.22 KB	0.1%	44 B	["PrivateSymbol.Object"]: Function @202816 function Object
2.22 KB	0.1%	44 B	Object: Function @202816 function Object
2.22 KB	0.1%	44 B	["PrivateSymbol.Object"]: Function @202816 function Object
2.17 KB	0.1%	39 B	Number @203745 Number {}
2.02 KB	0.1%	28 B	Object @202812 {}
1.68 KB	0.1%	21 B	PromisePrototype @203749 Promise {Symbol(Symbol.toStringTag): "Promise"}

JavaScript Allocations

Details 〉 Snapshot List 〉 Snapshot 1 〉 Instances

Retained Size		Self Size	Count	Class Name
1.16 MB	—	34.66 KB	864	Object
1019.27 KB	—	144.74 KB	3019	Function
765.05 KB	—	2.71 KB	2	Window
683.21 KB	—	87.12 KB	5568	Array
448.49 KB	—	17.33 KB	206	JSLexicalEnvironment
261.78 KB	—	246.84 KB	4477	string
130.17 KB	—	100 B	5	Promise
24.99 KB	—	452 B	1	WebGLRenderingContextBasePrototype
11.98 KB	—	81 B	1	String
11.64 KB	—	181 B	1	DocumentPrototype
10.96 KB	—	179 B	1	ElementPrototype
10.25 KB	—	92 B	1	CanvasRenderingContext2DPrototype
9.60 KB	—	800 B	25	GetterSetter
9.31 KB	—	47 B	1	Prototype
5.93 KB	—	60 B	1	Math
5.27 KB	—	60 B	2	InjectedScriptHost
5.13 KB	—	51 B	1	webkitAudioContextPrototype
5.05 KB	—	57 B	1	RangePrototype
4.94 KB	—	62 B	1	SVGSVGElementPrototype
4.43 KB	—	45 B	1	SVGPathElementPrototype
3.95 KB	—	37 B	1	Console
3.73 KB	—	2.36 KB	27	RegExp
3.61 KB	—	72 B	1	HTMLMediaElementPrototype
3.25 KB	—	65 B	1	NodePrototype
3.24 KB	—	43 B	1	SelectionPrototype
3.08 KB	—	23 B	1	WritableStreamPrototype
3.00 KB	—	23 B	1	ReadableStreamPrototype

JavaScript Allocations

Details 〉 Snapshot List 〉 Snapshot 1 〉 Instances

Retained Size		Self Size	Count	Class Name
1.16 MB	—	34.66 KB	864	Object
142.68 KB	7.6%	114 B		@203546 {version: "3.5.17", ascending: function, descending: function, min: function, max:
106.64 KB	5.6%	33 B		@222525 {name: "Iridium-33 Debris", url: "data/iridium-33-debris.txt", satellites: Promise}
85.04 KB	4.5%	48 B		@213615 {type: "Feature", properties: {}, geometry: Object}
84.72 KB	4.5%	32 B		@213619 {type: "MultiPolygon", coordinates: Array}
68.46 KB	3.6%	163 B		@221640 {stream: function, area: function, bounds: function, centroid: function, clipExtent
68.04 KB	3.6%	83 B		@202724 {_lastBoundObjectId: 141, _idToWrappedObject: Object, _idToObjectGroupName: {}, _obj
43.95 KB	2.3%	97 B		@213580 GlobalMap {_width: 960, _height: 600, _takeHeapSnapshots: false, element: , _fo
42.00 KB	2.2%	432 B		@208176 {isPrimitiveValue: function, previewValue: function, functionDetails: function, wrap
33.60 KB	1.8%	144 B		@203544 {version: "1.2.0", constants: Object, degreesLat: function, degreesLong: function,
22.66 KB	1.2%	65 B		@230081 {point: function, sphere: function, lineStart: function, lineEnd: function, polygonS
19.53 KB	1.0%	64 B		@230236 {point: function, lineStart: function, lineEnd: function, polygonStart: function, po
12.88 KB	0.7%	97 B		@212359 {year: function, years: function, day: function, days: function, dayOfYear: function
12.69 KB	0.7%	64 B		@207323 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: fu
12.50 KB	0.7%	192 B		@207420 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: fu
11.91 KB	0.6%	176 B		@215695 {getDate: function, getDay: function, getFullYear: function, getHours: function, get
9.82 KB	0.5%	33 B		@222527 {name: "Science Experiments", url: "data/science.txt", satellites: Promise}
9.70 KB	0.5%	66 B		@203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, mergeArcs:
9.48 KB	0.5%	64 B		@230328 {point: function, lineStart: function, lineEnd: function, polygonStart: function, po
9.33 KB	0.5%	208 B		@214320 {a: function, A: function, b: function, B: function, c: function, …}
9.29 KB	0.5%	33 B		@222526 {name: "Spy Satellites", url: "data/intelsat.txt", satellites: Promise}
7.95 KB	0.4%	32 B		@212314 d3_Map {_: Object}
7.92 KB	0.4%	206 B		@214804 {aliceblue: d3_color, antiquewhite: d3_color, aqua: d3_color, aquamarine: d3_color,
7.65 KB	0.4%	71 B		@221630 {linear: function, log: function, pow: function, sqrt: function, ordinal: function,
7.07 KB	0.4%	70 B		@221632 {bundle: function, chord: function, force: function, hierarchy: function, partition:
6.63 KB	0.4%	80 B		@224282 {Point: Object, MultiPoint: Object, LineString: Object, MultiLineString: Object, Pol
6.43 KB	0.3%	32 B		@212338 d3_Map {_: Object}

Snapshot 1 〉 Instances

Self Size	Count	Class Name
4.66 KB	864	▼ Object
114 B		▶ @203546 {version: "3.5.17", ascending: function, descending: function, min: function, max: function, …}
33 B		▶ @222525 {name: "Iridium-33 Debris", url: "data/iridium-33-debris.txt", satellites: Promise}
48 B		▶ @213615 {type: "Feature", properties: {}, geometry: Object}
32 B		▶ @213619 {type: "MultiPolygon", coordinates: Array}
163 B		▶ @221640 {stream: function, area: function, bounds: function, centroid: function, clipExtent: function, …}
83 B		▶ @202724 {_lastBoundObjectId: 141, _idToWrappedObject: Object, _idToObjectGroupName: {}, _objectGroups: {}, _modules: {Co…
97 B		▶ @213580 GlobalMap {_width: 960, _height: 600, _takeHeapSnapshots: false, element: , _foregroundContext: CanvasRenderi
432 B		▶ @208176 {isPrimitiveValue: function, previewValue: function, functionDetails: function, wrapObject: function, setExcepti…
144 B		▶ @203544 {version: "1.2.0", constants: Object, degreesLat: function, degreesLong: function, eciToEcf: function, …}
65 B		▶ @230081 {point: function, sphere: function, lineStart: function, lineEnd: function, polygonStart: function, …}
64 B		▶ @230236 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function, …}
97 B		▶ @212359 {year: function, years: function, day: function, days: function, dayOfYear: function, …}
64 B		▶ @207323 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
192 B		▶ @207420 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
176 B		▶ @215695 {getDate: function, getDay: function, getFullYear: function, getHours: function, getMilliseconds: function, …}
33 B		▶ @222527 {name: "Science Experiments", url: "data/science.txt", satellites: Promise}
66 B		▶ @203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, mergeArcs: function, …}
64 B		▶ @230328 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function}
208 B		▶ @214320 {a: function, A: function, b: function, B: function, c: function, …}
33 B		▶ @222526 {name: "Spy Satellites", url: "data/intelsat.txt", satellites: Promise}
32 B		▶ @212314 d3_Map {_: Object}
206 B		▶ @214804 {aliceblue: d3_color, antiquewhite: d3_color, aqua: d3_color, aquamarine: d3_color, azure: d3_color, …}
71 B		▶ @221630 {linear: function, log: function, pow: function, sqrt: function, ordinal: function, …}
70 B		▶ @221632 {bundle: function, chord: function, force: function, hierarchy: function, partition: function, …}
80 B		▶ @224282 {Point: Object, MultiPoint: Object, LineString: Object, MultiLineString: Object, Polygon: Object, …}
32 B		▶ @212338 d3_Map {_: Object}

Snapshot 1 〉 Instances

Self Size	Count	Class Name
34.66 KB	864	▼ Object
114 B		▶ @203546 {version: "3.5.17", ascending: function, descending: function, min: function, max: function, …}
33 B		▶ @22252[illegible] {name: "Iridium-33 Debris", url: "data/iridium-33-debris.txt", satellites: Promise}
48 B		▶ @213615 {type: "Feature", properties: {}, geometry: Object}
32 B		▶ @213619 {type: "MultiPolygon", coordinates: Array}
163 B		▶ @221640 {stream: function, area: function, bounds: function, centroid: function, clipExtent: function, …}
83 B		▶ @202724 {_lastBoundObjectId: 141, _idToWrappedObject: Object, _idToObjectGroupName: {}, _objectGroups: {}, _modules: {Co…
97 B		▶ @213580 GlobalMap {_width: 960, _height: 600, _takeHeapSnapshots: false, element: , _foregroundContext: CanvasRenderi
432 B		▶ @208176 {isPrimitiveValue: function, previewValue: function, functionDetails: function, wrapObject: function, setExcepti…
144 B		▶ @203544 {version: "1.2.0", constants: Object, degreesLat: function, degreesLong: function, eciToEcf: function, …}
65 B		▶ @230081 {point: function, sphere: function, lineStart: function, lineEnd: function, polygonStart: function, …}
64 B		▶ @230236 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function, …}
97 B		▶ @212359 {year: function, years: function, day: function, days: function, dayOfYear: function, …}
64 B		▶ @207323 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
192 B		▶ @207420 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
176 B		▶ @215695 {getDate: function, getDay: function, getFullYear: function, getHours: function, getMilliseconds: function, …}
33 B		▶ @222527 {name: "Science Experiments", url: "data/science.txt", satellites: Promise}
66 B		▶ @203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, mergeArcs: function, …}
64 B		▶ @230328 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function}
208 B		▶ @214320 {a: function, A: function, b: function, B: function, c: function, …}
33 B		▶ @222526 {name: "Spy Satellites", url: "data/intelsat.txt", satellites: Promise}
32 B		▶ @212314 d3_Map {_: Object}
206 B		▶ @214804 {aliceblue: d3_color, antiquewhite: d3_color, aqua: d3_color, aquamarine: d3_color, azure: d3_color, …}
71 B		▶ @221630 {linear: function, log: function, pow: function, sqrt: function, ordinal: function, …}
70 B		▶ @221632 {bundle: function, chord: function, force: function, hierarchy: function, partition: function, …}
80 B		▶ @224282 {Point: Object, MultiPoint: Object, LineString: Object, MultiLineString: Object, Polygon: Object, …}
32 B		▶ @212338 d3_Map {_: Object}

Snapshot 1 › Instances

Self Size	Count	Class Name
34.66 KB	864	▼ Object
114 B		▶ @203546 {version: "3.5.17", ascending: function, descending: function, min: function, max: function, …}
33 B		▶ @222525 {name: "Iridium-33 Debris", url: "data/iridium-33-debris.txt", satellites: Promise}
48 B		▶ @213615 {type: "Feature", properties: {}, geometry: Object}
32 B		▶ @213619 {type: "MultiPolygon", coordinates: Array}
163 B		▶ @221640 {stream: function, area: function, bounds: function, centroid: function, clipExtent: function, …}
83 B		▶ @202724 {_lastBoundObjectId: 141, _idToWrappedObject: Object, _idToObjectGroupName: {}, _objectGroups: {}, _modules: {Co…
97 B		▶ @213580 GlobalMap {_width: 960, _height: 600, _takeHeapSnapshots: false, element: , _foregroundContext: CanvasRenderi
432 B		▶ @208176 {isPrimitiveValue: function, previewValue: function, functionDetails: function, wrapObject: function, setExcepti…
144 B		▶ @203544 {version: "1.2.0", constants: Object, degreesLat: function, degreesLong: function, eciToEcf: function, …}
65 B		▶ @230081 {point: function, sphere: function, lineStart: function, lineEnd: function, polygonStart: function, …}
64 B		▶ @230236 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function, …}
97 B		▶ @212359 {year: function, years: function, day: function, days: function, dayOfYear: function, …}
64 B		▶ @207323 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
192 B		▶ @207420 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
176 B		▶ @215695 {getDate: function, getDay: function, getFullYear: function, getHours: function, getMilliseconds: function, …}
33 B		▶ @222527 {name: "Science Experiments", url: "data/science.txt", satellites: Promise}
66 B		▶ @203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, mergeArcs: function, …}
64 B		▶ @230328 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function}
208 B		▶ @214320 {a: function, A: function, b: function, B: function, c: function, …}
33 B		▶ @222526 {name: "Spy Satellites", url: "data/intelsat.txt", satellites: Promise}
32 B		▶ @212314 d3_Map {_: Object}
206 B		▶ @214804 {aliceblue: d3_color, antiquewhite: d3_color, aqua: d3_color, aquamarine: d3_color, azure: d3_color, …}
71 B		▶ @221630 {linear: function, log: function, pow: function, sqrt: function, ordinal: function, …}
70 B		▶ @221632 {bundle: function, chord: function, force: function, hierarchy: function, partition: function, …}
80 B		▶ @224282 {Point: Object, MultiPoint: Object, LineString: Object, MultiLineString: Object, Polygon: Object, …}
32 B		▶ @212338 d3_Map {_: Object}

Snapshot 1 〉 Instances

Self Size	Count	Class Name
4.66 KB	864	▼ Object
114 B		▶ @203546 {version: "3.5.17", ascending: function, descending: function, min: function, max: function, …}
33 B		▶ @222525 {name: "Iridium-33 Debris", url: "data/iridium-33-debris.txt", satellites: Promise}
48 B		▶ @213615 {type: "Feature", properties: {}, geometry: Object}
32 B		▶ @213619 {type: "MultiPolygon", coordinates: Array}
163 B		▶ @… {stream: function, area: function, bounds: function, centroid: function, clipExtent: function, …}
83 B		…jectId: 141, _idToWrappedObject: Object, _idToObjectGroupName: {}, _objectGroups: {}, _modules: {Co…
97 B		…idth: 960, _height: 600, _takeHeapSnapshots: false, element: , _foregroundContext: CanvasRenderi
432 B		…alue: function, previewValue: function, functionDetails: function, wrapObject: function, setExcepti…
144 B		…2.0", constants: Object, degreesLat: function, degreesLong: function, eciToEcf: function, …}
65 B		…ion, sphere: function, lineStart: function, lineEnd: function, polygonStart: function, …}
64 B		▶ @230236 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function, …}
97 B		▶ @212359 {year: function, years: function, day: function, days: function, dayOfYear: function, …}
64 B		▶ @207323 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
192 B		▶ @207420 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
176 B		▶ @215695 {getDate: function, getDay: function, getFullYear: function, getHours: function, getMilliseconds: function, …}
33 B		▶ @222527 {name: "Science Experiments", url: "data/science.txt", satellites: Promise}
66 B		▶ @203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, mergeArcs: function, …}
64 B		▶ @230328 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function}
208 B		▶ @214320 {a: function, A: function, b: function, B: function, c: function, …}
33 B		▶ @222526 {name: "Spy Satellites", url: "data/intelsat.txt", satellites: Promise}
32 B		▶ @212314 d3_Map {_: Object}
206 B		▶ @214804 {aliceblue: d3_color, antiquewhite: d3_color, aqua: d3_color, aquamarine: d3_color, azure: d3_color, …}
71 B		▶ @221630 {linear: function, log: function, pow: function, sqrt: function, ordinal: function, …}
70 B		▶ @221632 {bundle: function, chord: function, force: function, hierarchy: function, partition: function, …}
80 B		▶ @224282 {Point: Object, MultiPoint: Object, LineString: Object, MultiLineString: Object, Polygon: Object, …}
32 B		▶ @212338 d3_Map {_: Object}

Shortest property path to @213619

window	Window @202770
__userInterface	Object @203543
_landFeature	Object @213615
geometry	Object @213619

Snapshot 1 〉 Instances

Self Size	Count	Class Name
4.66 KB	864	▼ Object
114 B		▶ @203546 {version: "3.5.17", ascending: function, descending: function, min: function, max: function, …}
33 B		▶ @222525 {name: "Iridium-33 Debris", url: "data/iridium-33-debris.txt", satellites: Promise}
48 B		▶ @213615 {type: "Feature", properties: {}, geometry: Object}
32 B		▶ @213619 {type: "MultiPolygon", coordinates: Array}
163 B		▶ @2 …on, area: function, bounds: function, centroid: function, clipExtent: function, …}
83 B		…ctId: 141, _idToWrappedObject: Object, _idToObjectGroupName: {}, _objectGroups: {}, _modules: {Co…
97 B		…th: 960, _height: 600, _takeHeapSnapshots: false, element: , _foregroundContext: CanvasRenderi
432 B		…ue: function, previewValue: function, functionDetails: function, wrapObject: function, setExcepti…
144 B		…2.0", constants: Object, degreesLat: function, degreesLong: function, eciToEcf: function, …}
65 B		…n, sphere: function, lineStart: function, lineEnd: function, polygonStart: function, …}
64 B		▶ @230236 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function, …}
97 B		▶ @212359 {year: function, years: function, day: function, days: function, dayOfYear: function, …}
64 B		▶ @207323 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
192 B		▶ @207420 {$: function, $$: function, _canQuerySelectorOnNode: function, $x: function, dir: function, …}
176 B		▶ @215695 {getDate: function, getDay: function, getFullYear: function, getHours: function, getMilliseconds: function, …}
33 B		▶ @222527 {name: "Science Experiments", url: "data/science.txt", satellites: Promise}
66 B		▶ @203545 {version: "1.6.26", mesh: function, meshArcs: function, merge: function, mergeArcs: function, …}
64 B		▶ @230328 {point: function, lineStart: function, lineEnd: function, polygonStart: function, polygonEnd: function}
208 B		▶ @214320 {a: function, A: function, b: function, B: function, c: function, …}
33 B		▶ @222526 {name: "Spy Satellites", url: "data/intelsat.txt", satellites: Promise}
32 B		▶ @212314 d3_Map {_: Object}
206 B		▶ @214804 {aliceblue: d3_color, antiquewhite: d3_color, aqua: d3_color, aquamarine: d3_color, azure: d3_color, …}
71 B		▶ @221630 {linear: function, log: function, pow: function, sqrt: function, ordinal: function, …}
70 B		▶ @221632 {bundle: function, chord: function, force: function, hierarchy: function, partition: function, …}
80 B		▶ @224282 {Point: Object, MultiPoint: Object, LineString: Object, MultiLineString: Object, Polygon: Object, …}
32 B		▶ @212338 d3_Map {_: Object}

Shortest property path to @213619

window	Window @202770
__userInterface	Object @203543
_landFeature	Object @213615
geometry	Object @213619

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.0

JavaScript Allocations

Details | Snapshot List

Filter Reco

Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 > JavaScript Allocations > Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.0

JavaScript Allocations

Details > Snapshot List

Filter Reco

Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger | Co

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.0

JavaScript Allocations

Details | Snapshot List | Select baseline snapshot | Filter Reco

Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger

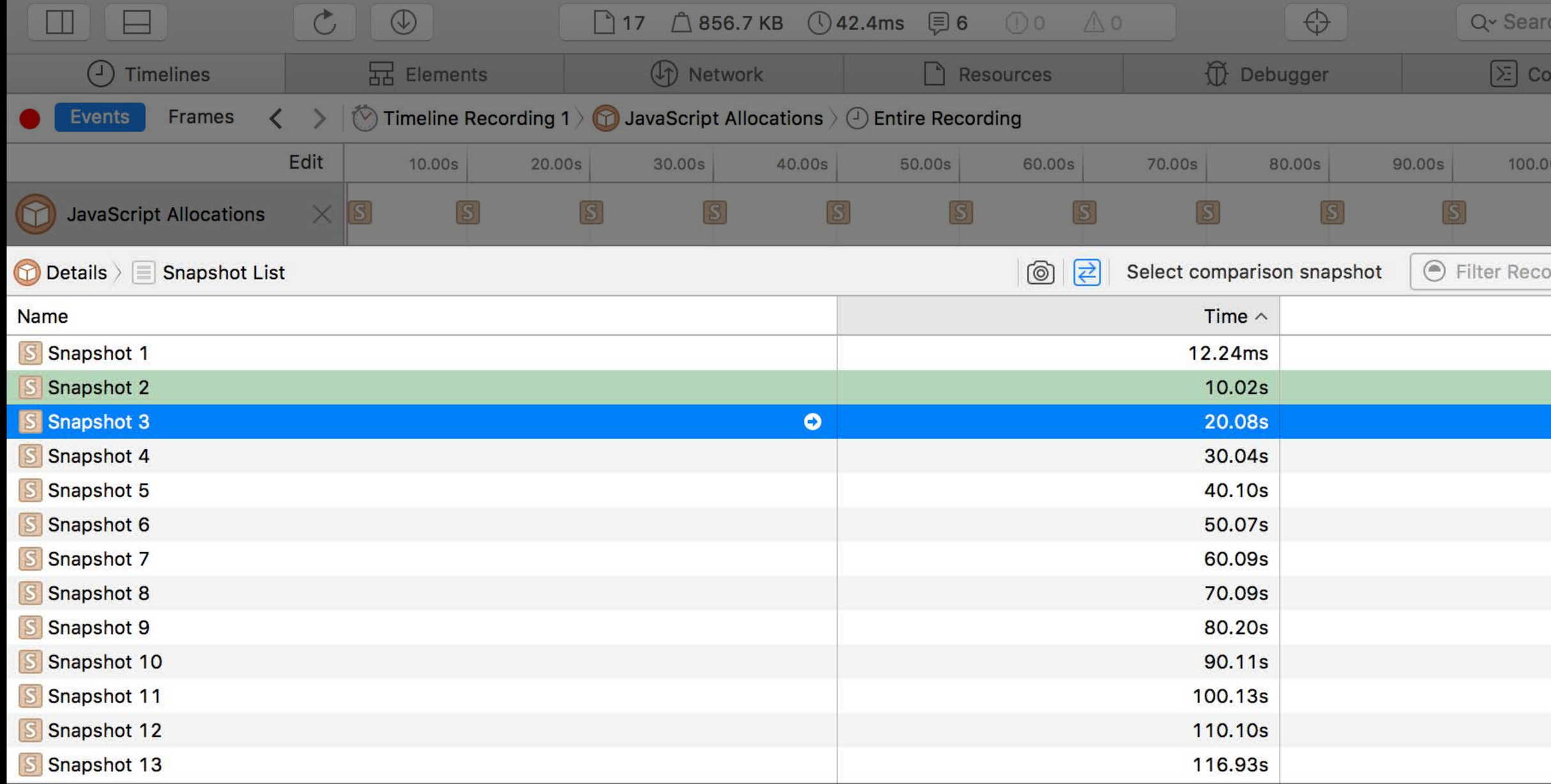
Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.0

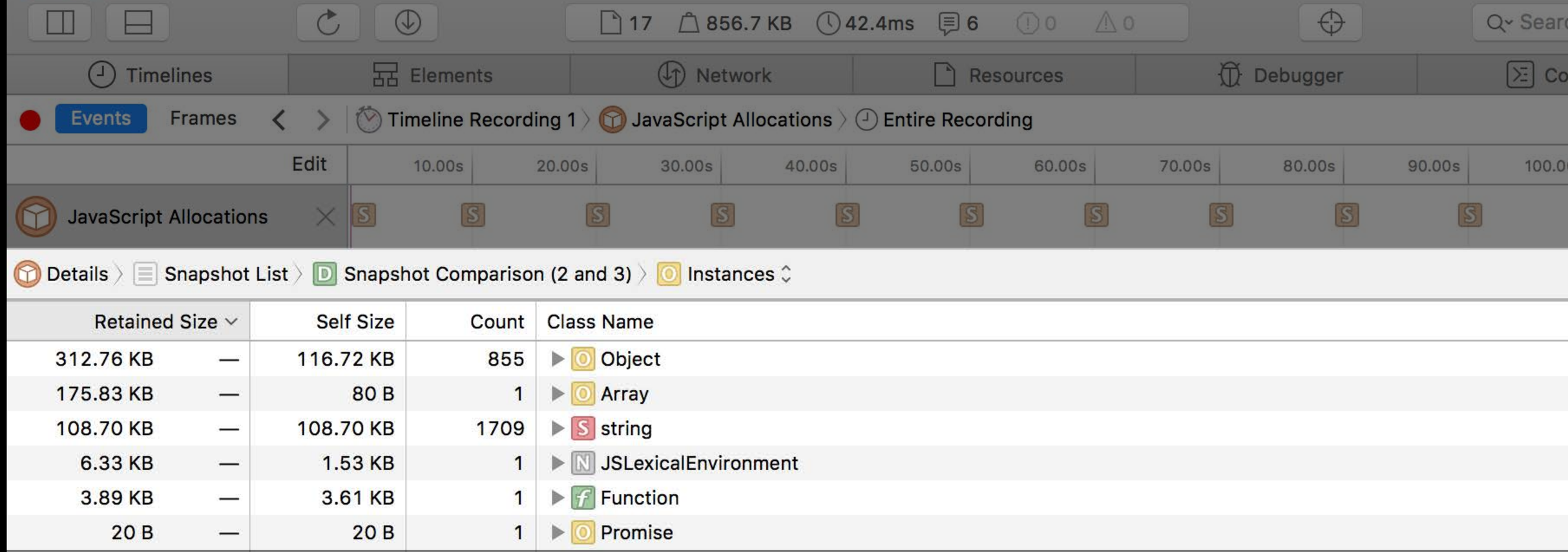
JavaScript Allocations

Details | Snapshot List | Select comparison snapshot | Filter Reco

Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s



Name	Time
Snapshot 1	12.24ms
Snapshot 2	10.02s
Snapshot 3	20.08s
Snapshot 4	30.04s
Snapshot 5	40.10s
Snapshot 6	50.07s
Snapshot 7	60.09s
Snapshot 8	70.09s
Snapshot 9	80.20s
Snapshot 10	90.11s
Snapshot 11	100.13s
Snapshot 12	110.10s
Snapshot 13	116.93s



Retained Size		Self Size	Count	Class Name
312.76 KB	—	116.72 KB	855	Object
175.83 KB	—	80 B	1	Array
108.70 KB	—	108.70 KB	1709	string
6.33 KB	—	1.53 KB	1	JSLexicalEnvironment
3.89 KB	—	3.61 KB	1	Function
20 B	—	20 B	1	Promise

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.0

JavaScript Allocations

Details | Snapshot List | Snapshot Comparison (2 and 3) | Instances

Retained Size		Self Size	Count	Class Name
312.76 KB	—	116.72 KB	855	Object
622 B	0.1%	34 B		@41661 {name: "SDO", tle1: "1 36395U 10005A 16134.59288247 -.00000048 00000-0
422 B	0.1%	34 B		@41747 {name: "AZERSPACE 1", tle1: "1 39079U 13006B 16135.22666819 .00000115 00
422 B	0.1%	34 B		@41746 {name: "AMAZONAS 3", tle1: "1 39078U 13006A 16134.52583721 -.00000303 000
422 B	0.1%	34 B		@41745 {name: "TDRS 11", tle1: "1 39070U 13004A 16135.74191650 .00000068 00000-
422 B	0.1%	34 B		@41744 {name: "MEXSAT 3", tle1: "1 39035U 12075B 16134.67493171 -.00000045 00000
422 B	0.1%	34 B		@41743 {name: "SKYNET 5D", tle1: "1 39034U 12075A 16135.93072697 .00000083 0000
422 B	0.1%	34 B		@41742 {name: "YAMAL 402", tle1: "1 39022U 12070A 16134.65702622 .00000066 0000
422 B	0.1%	34 B		@41741 {name: "EUTELSAT 70B", tle1: "1 39020U 12069A 16135.15889590 -.00000062 0
422 B	0.1%	34 B		@41740 {name: "CHINASAT 12 (ZX 12)", tle1: "1 39017U 12067A 16136.04648314 -.0000
422 B	0.1%	34 B		@41739 {name: "ECHOSTAR 16", tle1: "1 39008U 12065A 16134.52729796 -.00000302 00
422 B	0.1%	34 B		@41738 {name: "EUTELSAT 21B", tle1: "1 38992U 12062B 16134.29701339 .00000109 0
422 B	0.1%	34 B		@41737 {name: "STAR ONE C3", tle1: "1 38991U 12062A 16135.06589547 -.00000268 00
422 B	0.1%	34 B		@41736 {name: "YAMAL 300K", tle1: "1 38978U 12061B 16134.74172091 .00000051 000
422 B	0.1%	34 B		@41735 {name: "LUCH 5B", tle1: "1 38977U 12061A 16134.78825772 -.00000147 00000-
422 B	0.1%	34 B		@41734 {name: "BEIDOU G6", tle1: "1 38953U 12059A 16136.09488288 -.00000152 0000
422 B	0.1%	34 B		@41733 {name: "INTELSAT 23 (IS-23)", tle1: "1 38867U 12057A 16134.47898666 -.0000
422 B	0.1%	34 B		@41732 {name: "GSAT-10", tle1: "1 38779U 12051B 16135.12418773 -.00000184 00000-
422 B	0.1%	34 B		@41731 {name: "ASTRA 2F", tle1: "1 38778U 12051A 16134.27868168 .00000129 00000
422 B	0.1%	34 B		@41730 {name: "INTELSAT 21 (IS-21)", tle1: "1 38749U 12045A 16133.39130764 -.000

17 856.7 KB 42.4ms 6 0 0

Timelines | Elements | Network | Resources | Debugger

Events | Frames | Timeline Recording 1 | JavaScript Allocations | Entire Recording

Edit | 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s | 70.00s | 80.00s | 90.00s | 100.0

JavaScript Allocations

Details | Snapshot List | Snapshot Comparison (2 and 3) | Instances

Retained Size		Self Size	Count	Class Name
312.76 KB	—	116.72 KB	855	Object
622 B	0.1%	34 B		@41661 {name: "SDO", tle1: "1 36395U 10005A 16134.59288247 -.00000048 00000-0
422 B	0.1%	34 B		ACE 1", tle1: "1 39079U 13006B 16135.22666819 .00000115 00
422 B	0.1%	34 B		AS 3", tle1: "1 39078U 13006A 16134.52583721 -.00000303 000
422 B	0.1%	34 B		1", tle1: "1 39070U 13004A 16135.74191650 .00000068 00000-
422 B	0.1%	34 B		T 3", tle1: "1 39035U 12075B 16134.67493171 -.00000045 0000
422 B	0.1%	34 B		T 5D", tle1: "1 39034U 12075A 16135.93072697 .00000083 000
422 B	0.1%	34 B		402", tle1: "1 39022U 12070A 16134.65702622 .00000066 000
422 B	0.1%	34 B		SAT 70B", tle1: "1 39020U 12069A 16135.15889590 -.00000062
422 B	0.1%	34 B		@41740 {name: "CHINASAT 12 (ZX 12)", tle1: "1 39017U 12067A 16136.04648314 -.000
422 B	0.1%	34 B		@41739 {name: "ECHOSTAR 16", tle1: "1 39008U 12065A 16134.52729796 -.00000302 0
422 B	0.1%	34 B		@41738 {name: "EUTELSAT 21B", tle1: "1 38992U 12062B 16134.29701339 .00000109
422 B	0.1%	34 B		@41737 {name: "STAR ONE C3", tle1: "1 38991U 12062A 16135.06589547 -.00000268 0
422 B	0.1%	34 B		@41736 {name: "YAMAL 300K", tle1: "1 38978U 12061B 16134.74172091 .00000051 000
422 B	0.1%	34 B		@41735 {name: "LUCH 5B", tle1: "1 38977U 12061A 16134.78825772 -.00000147 00000-
422 B	0.1%	34 B		@41734 {name: "BEIDOU G6", tle1: "1 38953U 12059A 16136.09488288 -.00000152 0000
422 B	0.1%	34 B		@41733 {name: "INTELSAT 23 (IS-23)", tle1: "1 38867U 12057A 16134.47898666 -.0000
422 B	0.1%	34 B		@41732 {name: "GSAT-10", tle1: "1 38779U 12051B 16135.12418773 -.00000184 00000-
422 B	0.1%	34 B		@41731 {name: "ASTRA 2F", tle1: "1 38778U 12051A 16134.27868168 .00000129 00000
422 B	0.1%	34 B		@41730 {name: "INTELSAT 21 (IS-21)", tle1: "1 38749U 12045A 16133.39130764 -.0000

Shortest property path to @41661

window	Window @19793
__userInterface	Object @19980
_globalMap	Object @26006
_satellites	Array @41401
[253]	Object @41661

Demo

Memory and JavaScript Allocations timelines

Brian Burg
Safari and WebKit Engineer

Analyzing Memory

Memory and JavaScript Allocations timelines

Quickly see memory spikes to investigate

Analyzing Memory

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Take heap snapshots to explore what keeps objects alive

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Don't leave in console.takeHeapSnapshot()

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Memory and JavaScript Allocations timelines

Quickly see memory spikes to investigate

Take heap snapshots to explore what keeps objects alive

Don't leave in console.takeHeapSnapshot()

Snapshots can have a performance impact

Connecting Web Inspector

Profiling Javascript

Analyzing Memory

Next Steps

Next Steps

Consider upgrading to WKWebView

Next Steps

Consider upgrading to WKWebView

Connect Web Inspector to your app

Next Steps

Consider upgrading to WKWebView

Connect Web Inspector to your app

Save time and deliver great performance

Next Steps

Consider upgrading to WKWebView

Connect Web Inspector to your app

Save time and deliver great performance

Stay updated on feature development

Web Inspector

NEW

NEW

Visual Styles Sidebar

Compare Heap Snapshots

Quick Open

Sampling Profiler

takeHeapSnapshot

Memory Timeline

Tail Call Stacks

JavaScript Call Trees

Pseudo Elements in DOM Tree

JavaScript Heap Objects

WebKit

WebKit

NEW

NEW

CSP 2.0

WOFF 2.0

<picture>

100% ES6

International API

WebDriver

Proper Tail Calls

Improved IndexedDB

CSS Variables

Unprefixed CSS Filters

Shadow DOM

WebKit

WebKit.org

Safari

Safari Technology Preview

More Information

https://developer.apple.com/wwdc16/420

Related Sessions

Extending Your App with Safari App Extensions	Nob Hill	Wednesday 4:00PM
Web Inspector and Modern JavaScript		WWDC 2014
Introducing the Modern WebKit API		WWDC 2014
What's New in Web Development in WebKit and Safari		WWDC 2014
Introducing Safari View Controller		WWDC 2015
Using Safari to Deliver and Debug a Responsive Web Design		WWDC 2015

Labs

Safari and WebKit Lab	Frameworks Lab C	Friday 4:30 PM

WWDC16