Nolan Lawson

Program Manager – Performance

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#msedgesummit

Microsoft

Web performance in the real world

How to make fast websites

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What is performance?

Page Load Time (PLT)

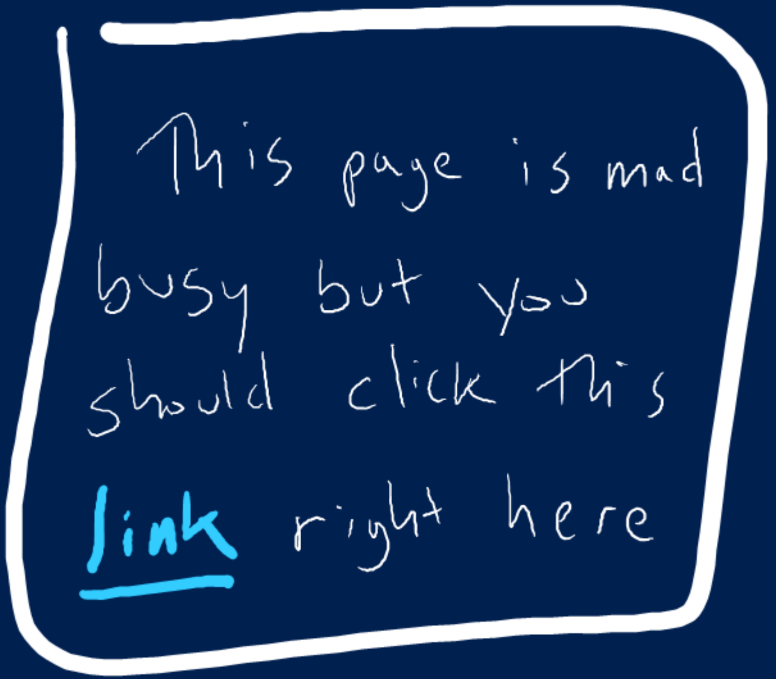
Page Load Time (PLT)

Animation / Framerate

Animation / Framerate

Responsiveness

Responsiveness



This page is mad busy but you should click this link right here

What is performance?

- Page Load Time (PLT)
- Animation, framerate
- Responsiveness
- Many more definitions of “fast”

TWO PERSPECTIVES ON PERFORMANCE

> “ Web devs wants to avoid antipatterns.
>
> Browser devs want to make antipatterns *faster*.

– Nolan Lawson

“Web performance in the real world” (the talk you are watching right now)

How web devs see the world

I want my website to be fast on all these browsers…

How browsers see the world

I want my browser to be fast on all these websites…

```
/* What’s wrong with this code? */

function doStuff(el) {
  el.style.height = 0
  el.getBoundingClientRect()
}

for (var i = 0; i < 5000; i++) {
  doStuff(el)
}
```

```
/* What’s wrong with this code? */

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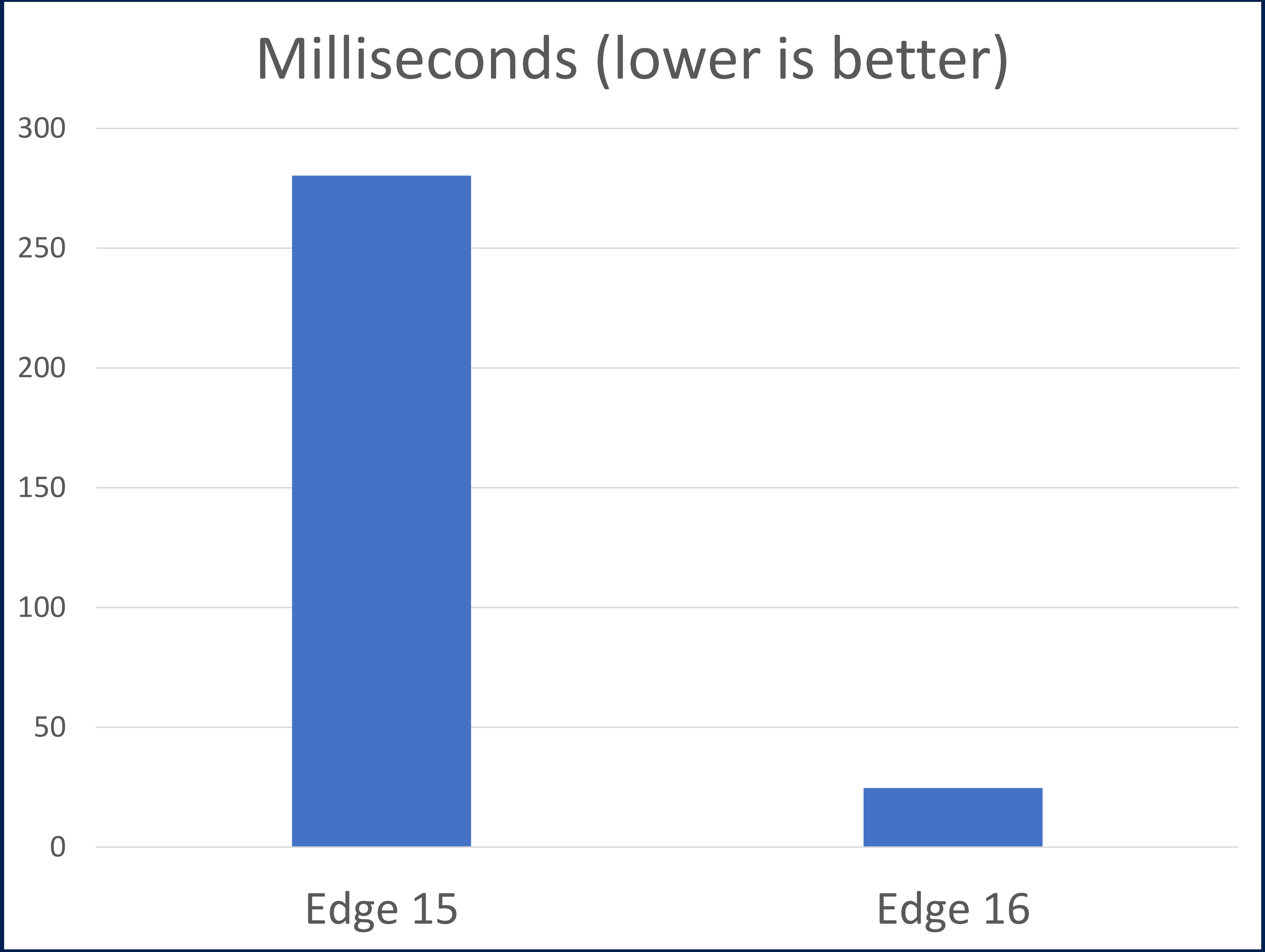
```

```
0 !== '0px'
```



https://bl.ocks.org/nolanlawson/raw/1dd8f322eace0237ec672b57f2122459/

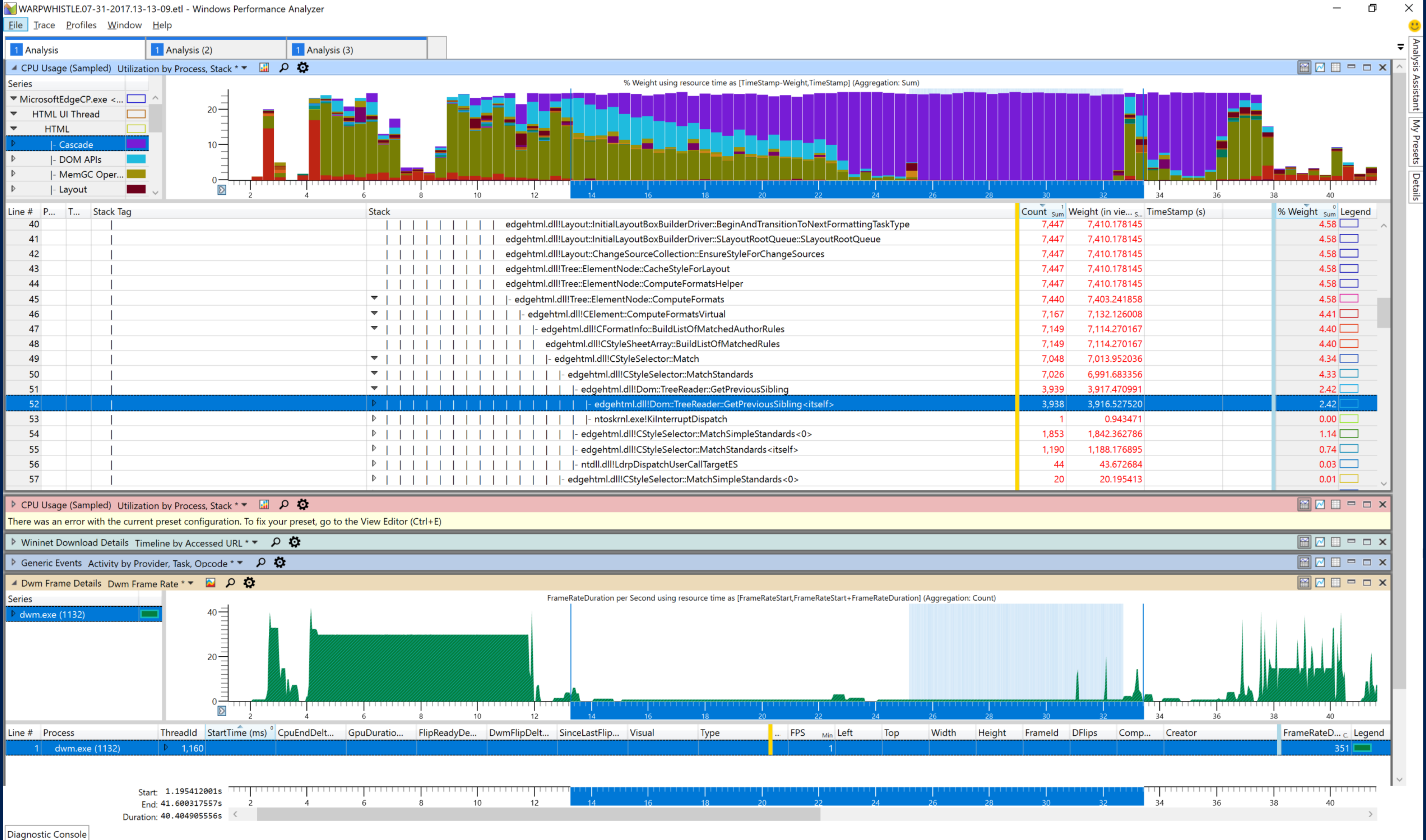
#msedgesummit

Goal

Goal

Goal

Performance Club


WARPWHISTLE.07-31-2017.13-13-09.etl - Windows Performance Analyzer
File Trace Profiles Window Help
Analysis
Analysis (2)
Analysis (3)
Analysis Assistant
My Presets
Details
CPU Usage (Sampled) Utilization by Process, Stack *
Series
MicrosoftEdgeCP.exe <...
HTML UI Thread
HTML
|- Cascade
|- DOM APIs
|- MemGC Oper...
|- Layout
% Weight using resource time as [TimeStamp-Weight,TimeStamp] (Aggregation: Sum)
20
10
0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40

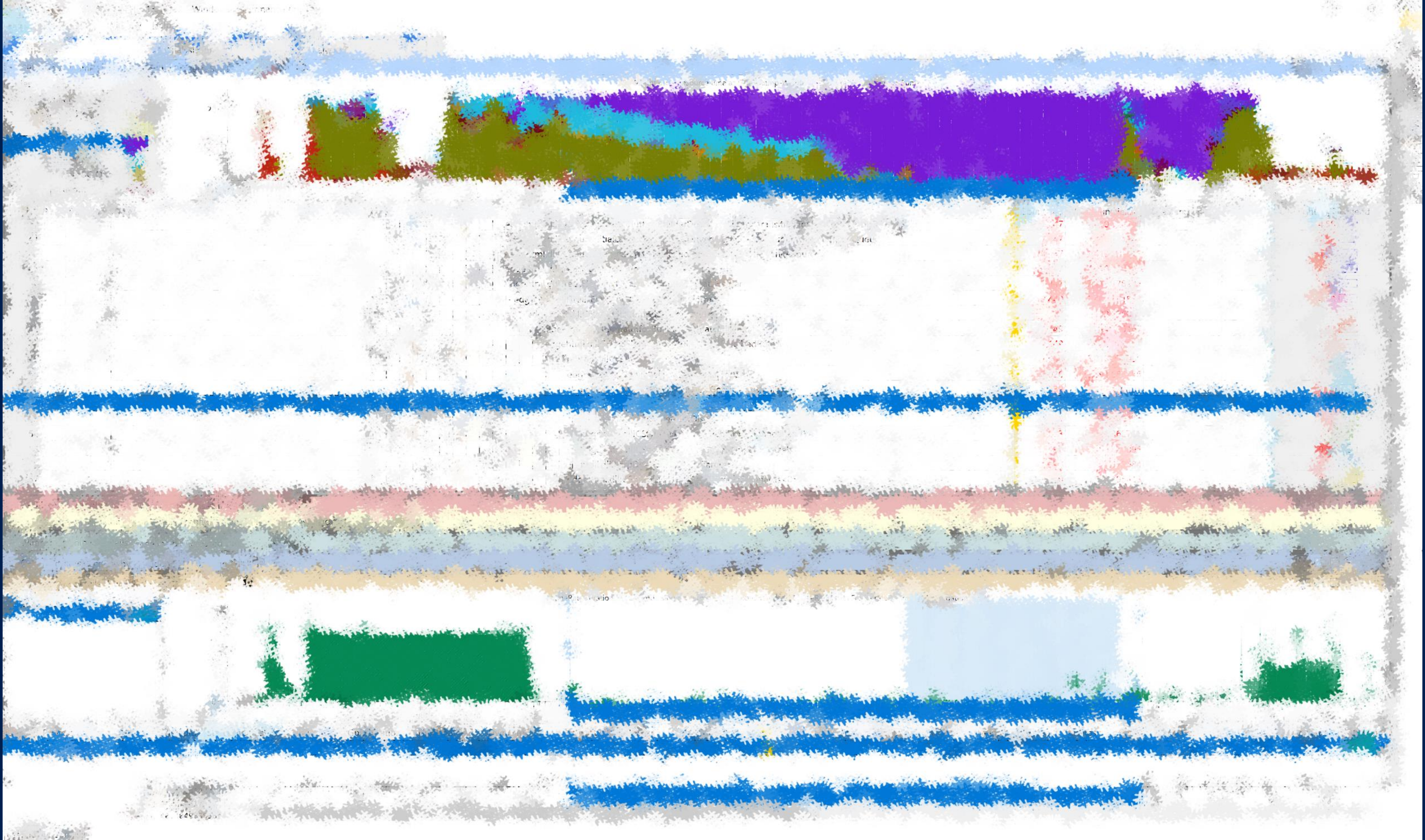
Line #	P...	T...	Stack Tag	Stack	Count Sum	Weight (in vie... Sum	TimeStamp (s)	% Weight Sum	Legend
40			|	edgehtml.dll!Layout::InitialLayoutBoxBuilderDriver::BeginAndTransitionToNextFormattingTaskType	7,447	7,410.178145		4.58	□
41			|	edgehtml.dll!Layout::InitialLayoutBoxBuilderDriver::SLayoutRootQueue::SLayoutRootQueue	7,447	7,410.178145		4.58	□
42			|	edgehtml.dll!Layout::ChangeSourceCollection::EnsureStyleForChangeSources	7,447	7,410.178145		4.58	□
43			|	edgehtml.dll!Tree::ElementNode::CacheStyleForLayout	7,447	7,410.178145		4.58	□
44			|	edgehtml.dll!Tree::ElementNode::ComputeFormatsHelper	7,447	7,410.178145		4.58	□
45			|	|- edgehtml.dll!Tree::ElementNode::ComputeFormats	7,440	7,403.241858		4.58	□
46			|	|- edgehtml.dll!CElement::ComputeFormatsVirtual	7,167	7,132.126008		4.41	□
47			|	|- edgehtml.dll!CFormatInfo::BuildListOfMatchedAuthorRules	7,149	7,114.270167		4.40	□
48			|	edgehtml.dll!CStyleSheetArray::BuildListOfMatchedRules	7,149	7,114.270167		4.40	□
49			|	|- edgehtml.dll!CStyleSelector::Match	7,048	7,013.952036		4.34	□
50			|	|- edgehtml.dll!CStyleSelector::MatchStandards	7,026	6,991.683356		4.33	□
51			|	|- edgehtml.dll!Dom::TreeReader::GetPreviousSibling	3,939	3,917.470991		2.42	□
52			|	|- edgehtml.dll!Dom::TreeReader::GetPreviousSibling<itself>	3,938	3,916.527520		2.42	□
53			|	|- ntoskrnl.exe!KiInterruptDispatch	1	0.943471		0.00	□
54			|	|- edgehtml.dll!CStyleSelector::MatchSimpleStandards<0>	1,853	1,842.362786		1.14	□
55			|	|- edgehtml.dll!CStyleSelector::MatchStandards<itself>	1,190	1,188.176895		0.74	□
56			|	|- ntdll.dll!LdrpDispatchUserCallTargetES	44	43.672684		0.03	□
57			|	|- edgehtml.dll!CStyleSelector::MatchSimpleStandards<0>	20	20.195413		0.01	□

There was an error with the current preset configuration. To fix your preset, go to the View Editor (Ctrl+E)

Wininet Download Details Timeline by Accessed URL *
Generic Events Activity by Provider, Task, Opcode *
Dwm Frame Details Dwm Frame Rate *
Series
dwm.exe (1132)
FrameRateDuration per Second using resource time as [FrameRateStart,FrameRateStart+FrameRateDuration] (Aggregation: Count)
40
20
0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40

Line #	Process	ThreadId	StartTime (ms)	CpuEndDelt...	GpuDuratio...	FlipReadyDe...	DwmFlipDelt...	SinceLastFlip...	Visual	Type	..	FPS Min	Left	Top	Width	Height	FrameId	DFlips	Comp...	Creator	FrameRateD... C	Legend
1	dwm.exe (1132)	1,160										1									351	🟩

Start: 1.195412001s
End: 41.600317557s
Duration: 40.404905556s



Performance Club

Performance Club

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Performance Club

PERF CLUB PARTNERS

PERF CLUB PARTNERS

- NotFlorx
- Toozled
- OwnDroop
- Astro.com
- Aloop Poodle
- Pongo Boy
- Addled Mustache
- Obelisk Wet Angels
- Forested
- Mazerati Tables
- Zorpy.com
- And many more!

You’ve found a perf issue!

You’ve found a perf issue!

You’ve found a perf issue!

SOLUTION: NO SHAME ZONE

Thank you!

#msedgesummit

Thank you!

…just kidding.

LEARNINGS FROM PERF CLUBS

- Every site is a special snowflake
- You can learn 1,000 perf tricks, then your site needs the 1,001st
- Learn how to *learn* about perf

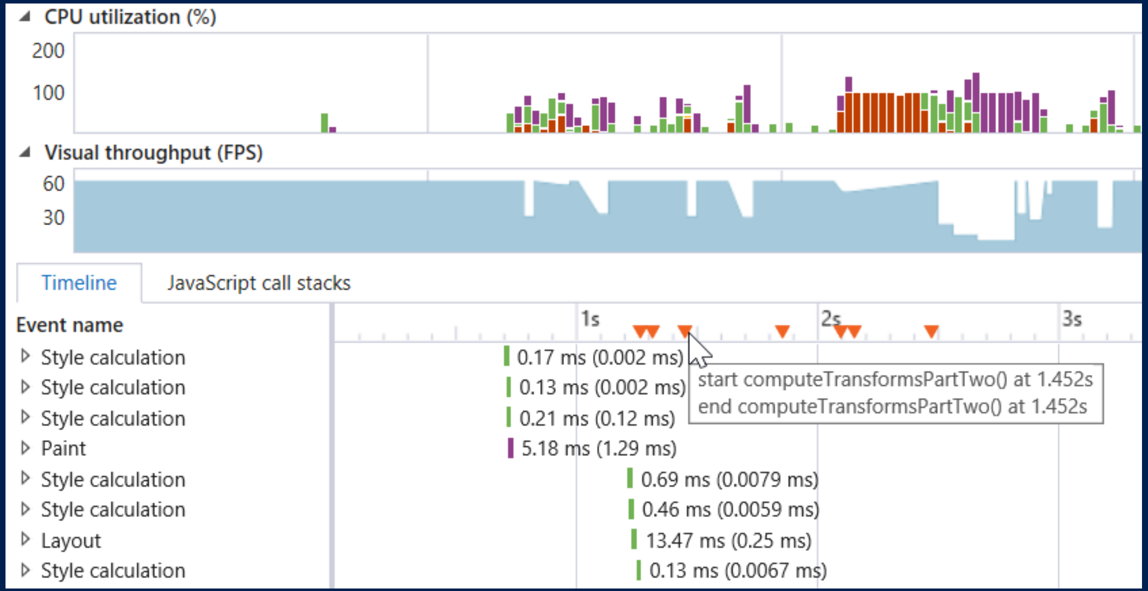
TOPICS

- Marks/measures
- Scrolling performance
- IntersectionObserver

Performance marks/measures

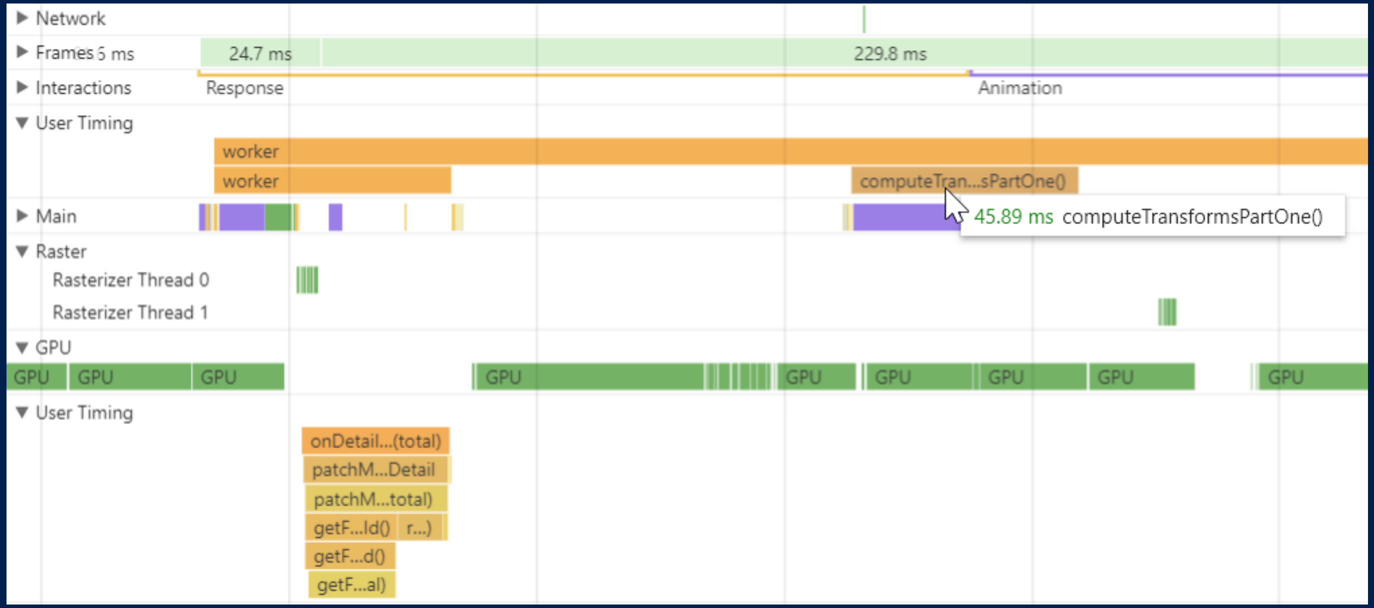
- Set a start/end, measure total time

Performance marks/measures

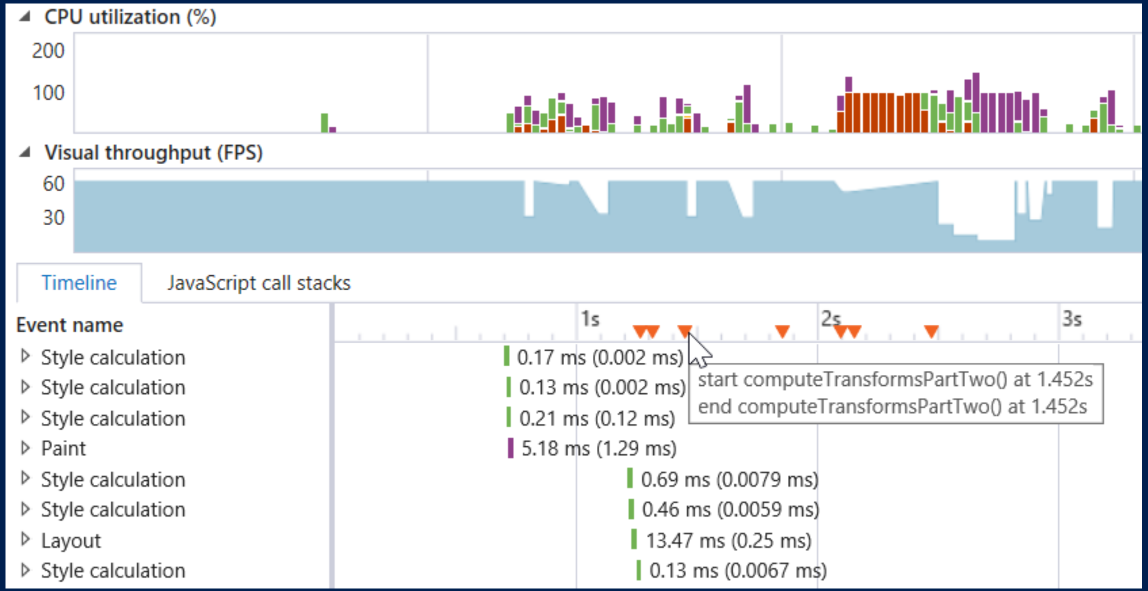


```
Event name
Style calculation     0.17 ms (0.002 ms)
Style calculation     0.13 ms (0.002 ms)
Style calculation     0.21 ms (0.12 ms)
Paint                 5.18 ms (1.29 ms)
Style calculation     0.69 ms (0.0079 ms)
Style calculation     0.46 ms (0.0059 ms)
Layout                13.47 ms (0.25 ms)
Style calculation     0.13 ms (0.0067 ms)
```

start computeTransformsPartTwo() at 1.452s
end computeTransformsPartTwo() at 1.452s



Performance marks/measures



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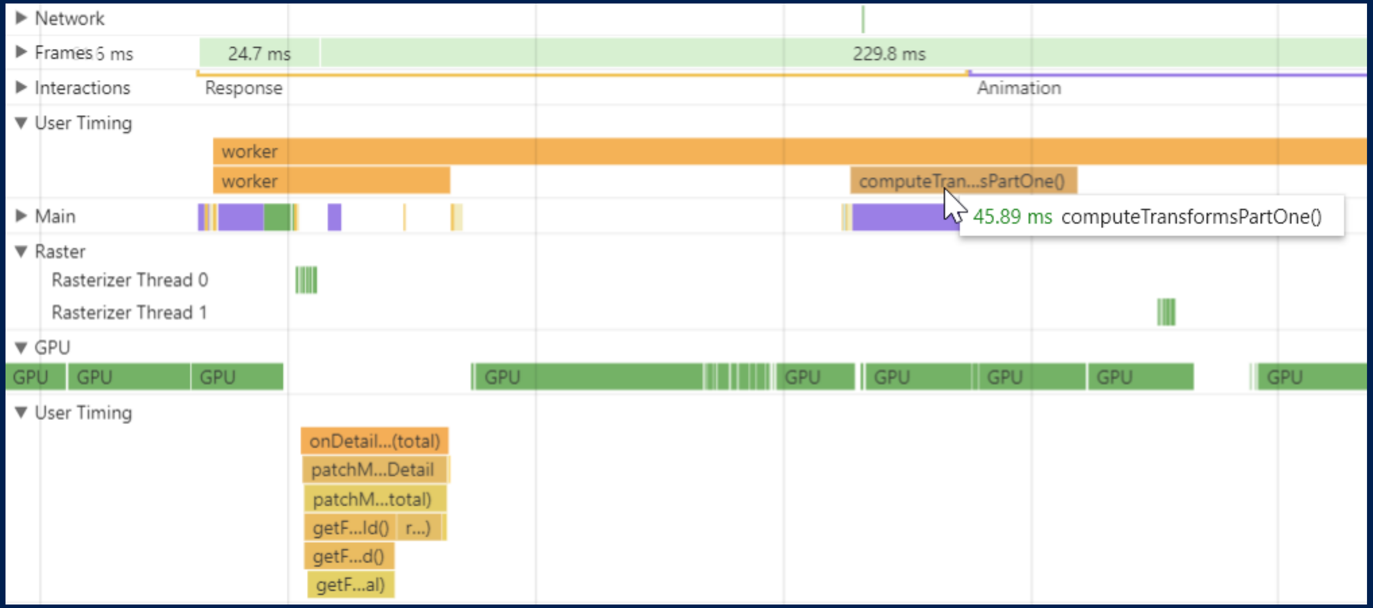
Style calculation    0.69 ms (0.0079 ms)
Style calculation    0.46 ms (0.0059 ms)
Layout               13.47 ms (0.25 ms)
Style calculation    0.13 ms (0.0067 ms)
```

start computeTransformsPartTwo() at 1.452s
end computeTransformsPartTwo() at 1.452s



45.89 ms computeTransformsPartOne()

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Performance marks/measures

```
performance.mark('start')
doExpensiveThing()
performance.mark('end')
performance.measure('total', 'start', 'end’)
const duration = performance
  .getEntriesByType('measure’)
  .slice(-1)[0].duration
```

Performance marks/measures

```
performance.mark('start')
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Performance marks/measures

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doExpensiveThing()
performance.mark('end')
performance.measure('total', 'start', 'end’)
const duration = performance
  .getEntriesByType('measure’)
  .slice(-1)[0].duration
```

marky

```
const marky = require('marky')
marky.mark('total')
doExpensiveThing()
const duration =
  marky.stop('total').duration
```

marky

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const marky = require('marky')
marky.mark('total')
doExpensiveThing()
const duration =
  marky.stop('total').duration
```

Scrolling performance

- The web is multi-threaded

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```
document.addEventListener('wheel', event => {
  if (someCondition()) {
    event.preventDefault()
  }
})
```

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```

#msedgesummit

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```
document.addEventListener('wheel', event => {
  if (someCondition()) {
    event.preventDefault()
  }
})
```

```
subscroller.addEventListener('wheel', event => {
  if (someCondition()) {
    event.preventDefault()
  }
})
```

```
subscroller.addEventListener('wheel', event => {
  if (someCondition()) {
    event.preventDefault()
  }
})
```

```
document.addEventListener('scroll', () => {
  /* scroll logic here */
})
```

```
document.addEventListener('scroll', () => {
  /* scroll logic here */
})
```

```
document.addEventListener('scroll', () => {
  /* scroll logic here */
})
```

```
document.addEventListener('wheel', () => {
  /* wheel logic here */
}, {passive: true})
```

```
document.addEventListener('wheel', () => {
  /* wheel logic here */
}, {passive: true})
```

HAVE YOU BLOCKED SCROLLING?

/* THE JANKINATOR */

```
/* THE JANKINATOR */

setInterval(() => {




}, 5000)
```

```
/* THE JANKINATOR */

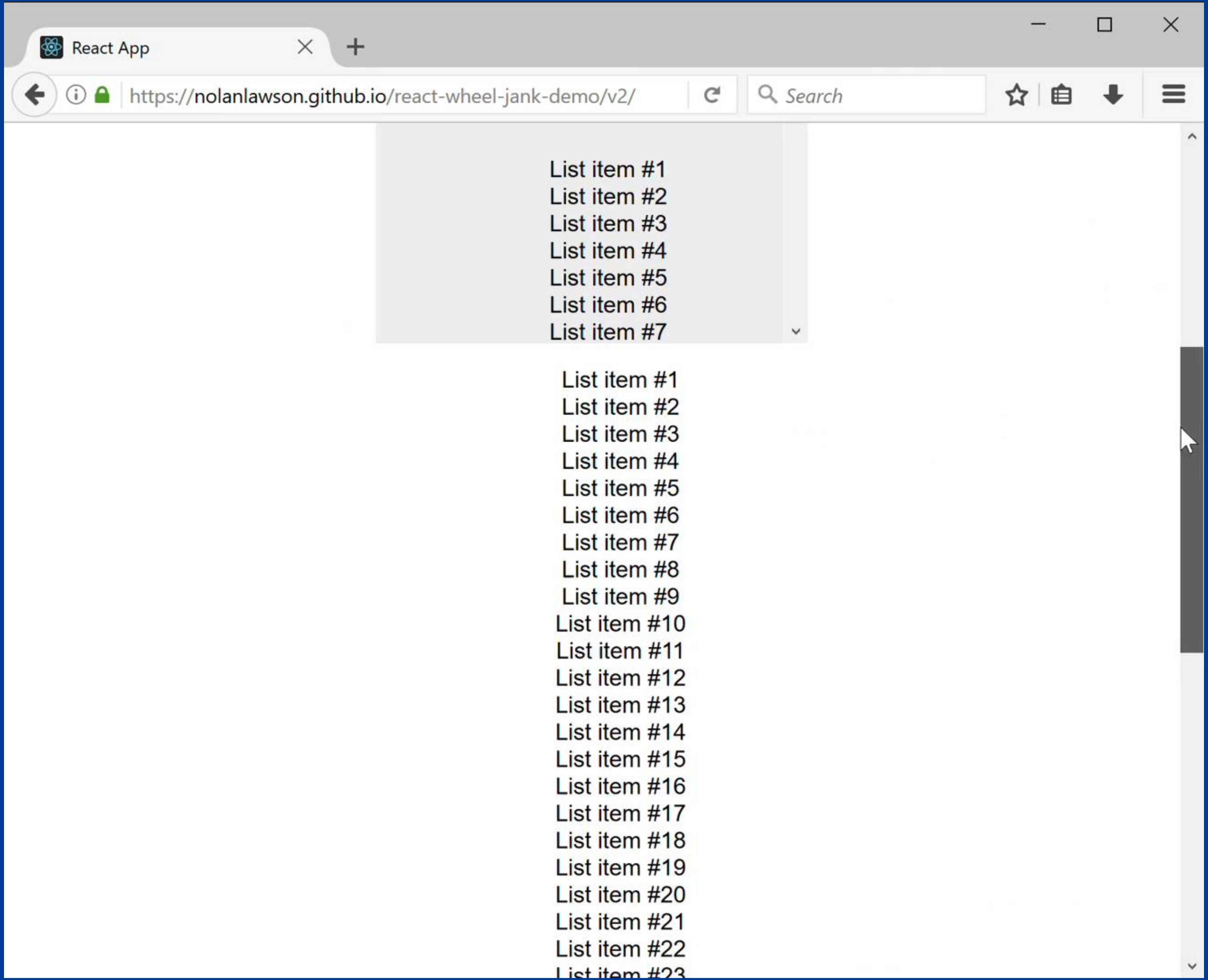
setInterval(() => {
  let start = Date.now()



}, 5000)
```

```
/* THE JANKINATOR */

setInterval(() => {
  let start = Date.now()
  while (Date.now() - start < 4000) {
    /* JANK ME AMADEUS */
  }
}, 5000)
```

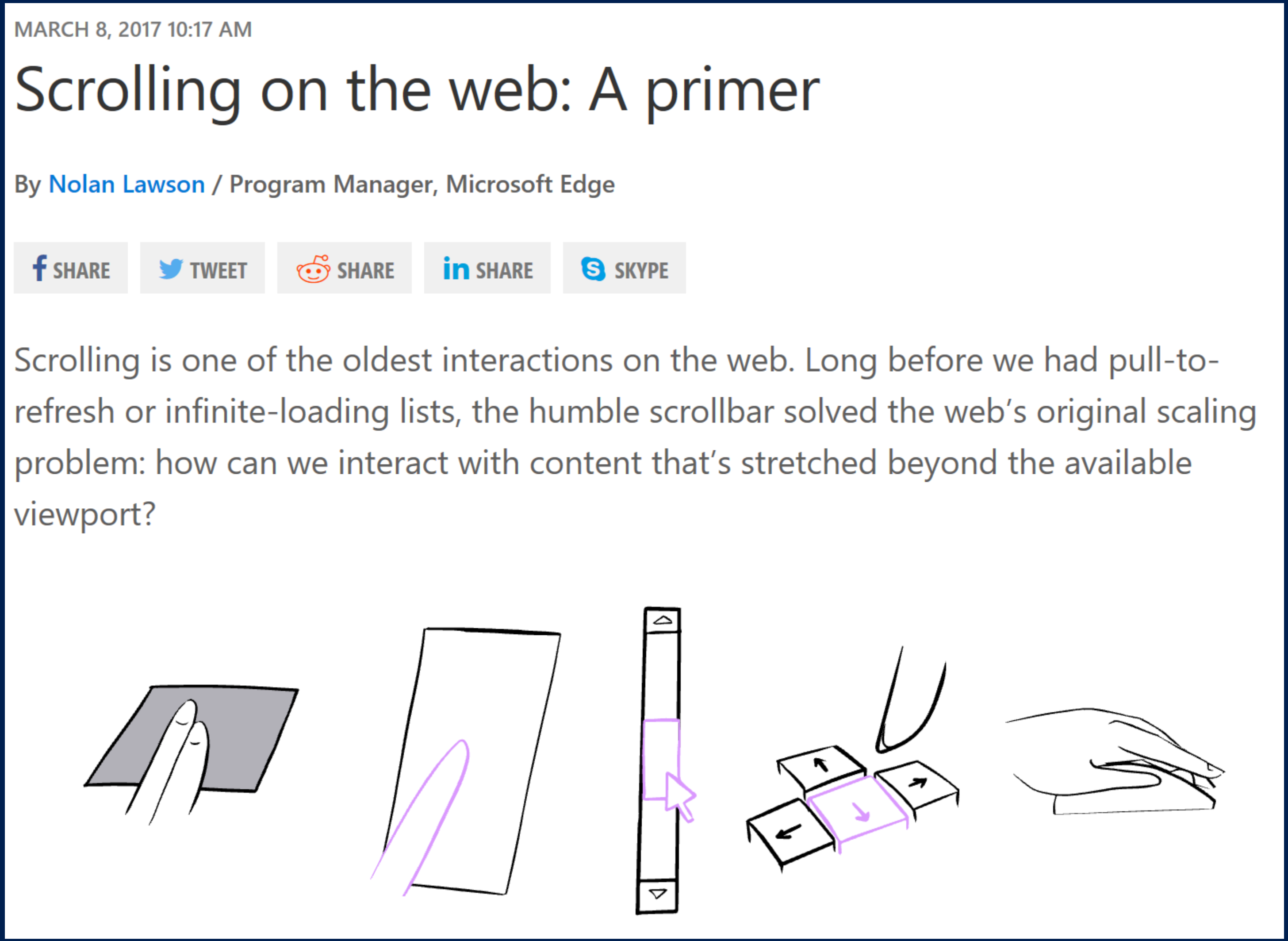


List item #1
List item #2
List item #3
List item #4
List item #5
List item #6
List item #7

List item #1
List item #2
List item #3
List item #4
List item #5
List item #6
List item #7
List item #8
List item #9
List item #10
List item #11
List item #12
List item #13
List item #14
List item #15
List item #16
List item #17
List item #18
List item #19
List item #20
List item #21
List item #22
List item #23

#msedgesummit

31 flavors of scrolling



MARCH 8, 2017 10:17 AM

Scrolling on the web: A primer

By Nolan Lawson / Program Manager, Microsoft Edge

Scrolling is one of the oldest interactions on the web. Long before we had pull-to-refresh or infinite-loading lists, the humble scrollbar solved the web's original scaling problem: how can we interact with content that's stretched beyond the available viewport?

https://blogs.windows.com/msedgedev/2017/03/08/scrolling-on-the-web/

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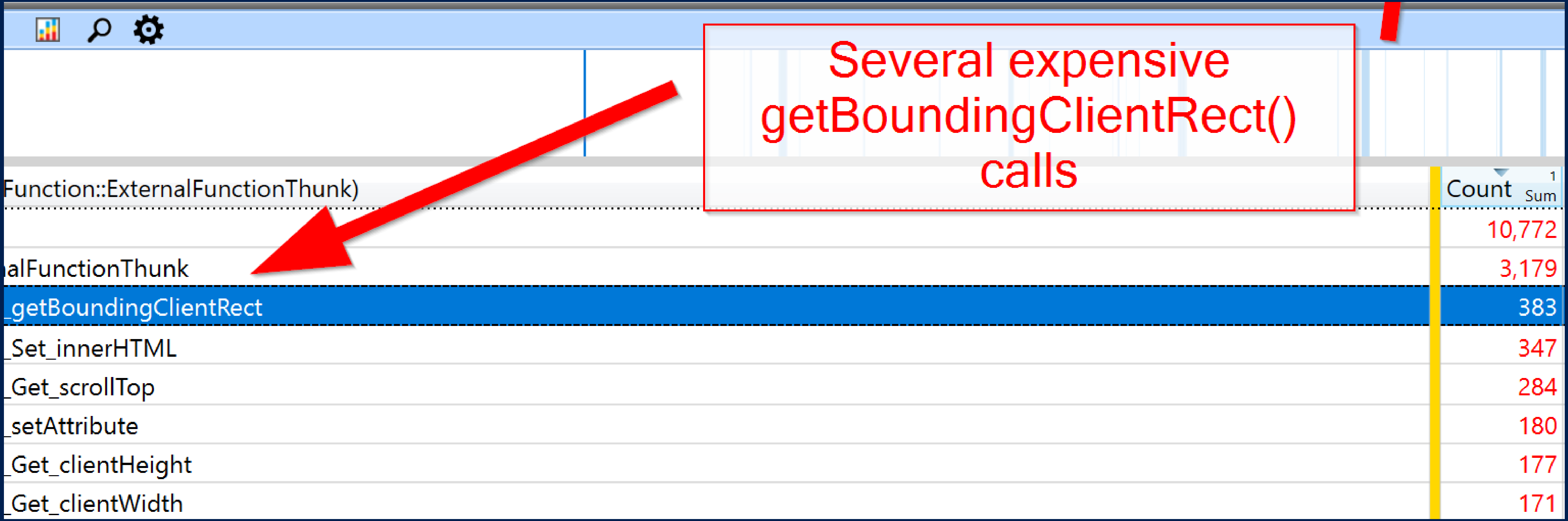
LAST TIP: INTERSECTION OBSERVER



Several expensive getBoundingClientRect() calls

Function::ExternalFunctionThunk)	Count Sum
	10,772
ıalFunctionThunk	3,179
_getBoundingClientRect	383
_Set_innerHTML	347
_Get_scrollTop	284
_setAttribute	180
_Get_clientHeight	177
_Get_clientWidth	171

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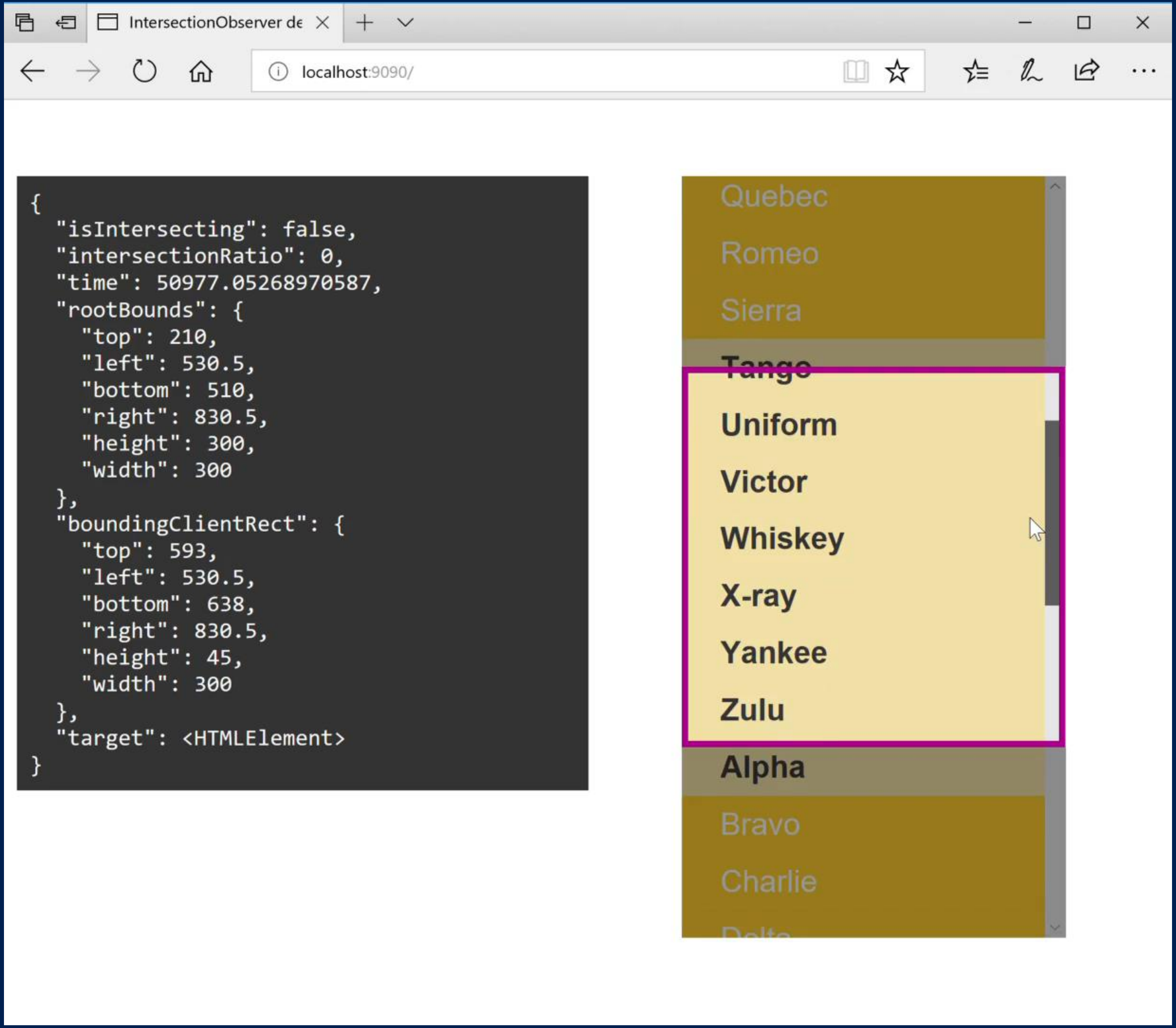
IntersectionObserver!

IntersectionObserver!

IntersectionObserver!



```
{
  "isIntersecting": false,
  "intersectionRatio": 0,
  "time": 50977.05268970587,
  "rootBounds": {
    "top": 210,
    "left": 530.5,
    "bottom": 510,
    "right": 830.5,
    "height": 300,
    "width": 300
  },
  "boundingClientRect": {
    "top": 593,
    "left": 530.5,
    "bottom": 638,
    "right": 830.5,
    "height": 45,
    "width": 300
  },
  "target": <HTMLElement>
}
```

https://bl.ocks.org/nolanlawson/raw/8776a4cfd75f5d5b312e355e971d8ebb

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```
const outer = document.getElementById('outer')
const inner = document.getElementById('inner')
const outer = document.getElementById('outer')
const inner = document.getElementById('inner')

const observer = new IntersectionObserver(
  callback, {root: outer}
)
observer.observe(inner)
```

```javascript
const outer = document.getElementById('outer')
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function callback(entries) {
  for (let entry of entries) {
    const innerRect = entry.boundingClientRect
    const outerRect = entry.rootBounds
    /* your code here */
  }
}
```

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```

Use IntersectionObserver for...

- Virtual lists
- Ads
- Ellipsis effects
- Anything where one box is on top of another box

REVIEW

- Marks/measures
- Scrolling performance
- IntersectionObserver

CONCLUSION

- Perf is more than “fast”
- 1000 tips aren’t always enough
- Measure, measure, measure
- Test on slow machines
- Test iteratively

DO A PERF CLUB

perfclub@microsoft.com

Thank you!

DECK & RESOURCES	aka.ms/summit2017perf
TWITTER	@nolanlawson
GITHUB	nolanlawson