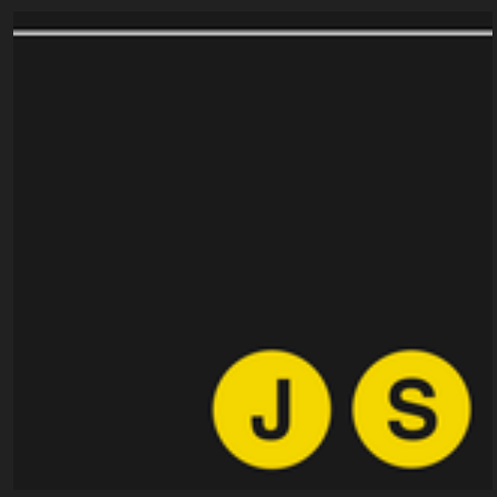
fantastic frontend performance tricks and why we do them

Jenna Zeigen
#perfmatters
4/2/19

Senior Frontend Engineer at Slack

Organizer of EmpireJS

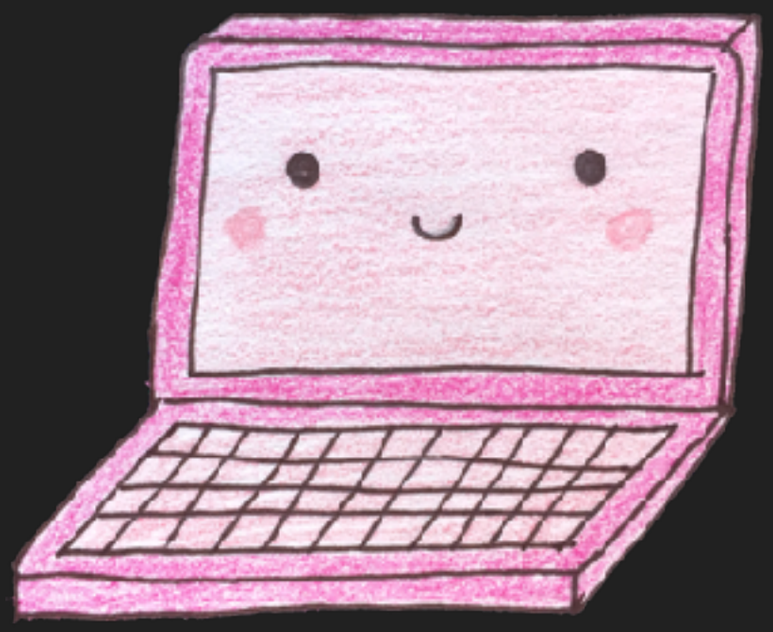
Organizer of BrooklynJS



jenna.is/at-perfmatters

@zeigenvector

very online.



[object Object]
@zeigenvector

If you think frontend engineering is lesser or easier, I dare you to delve into the world that is frontend performance optimization.

1:22 AM - 16 May 2018

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loading

+

rendering

loading

(keep things small)

+

rendering

loading

+ (keep things small)
(keep things smart)

rendering

loading

+ (keep things small)
(keep things smart)

rendering

(keep things smooth)

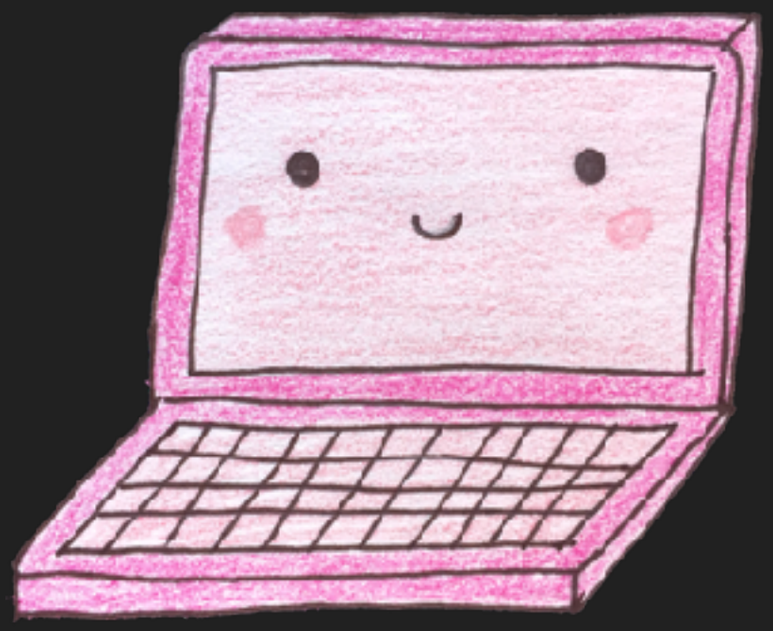
but wait

how do

websites?

how do websites?

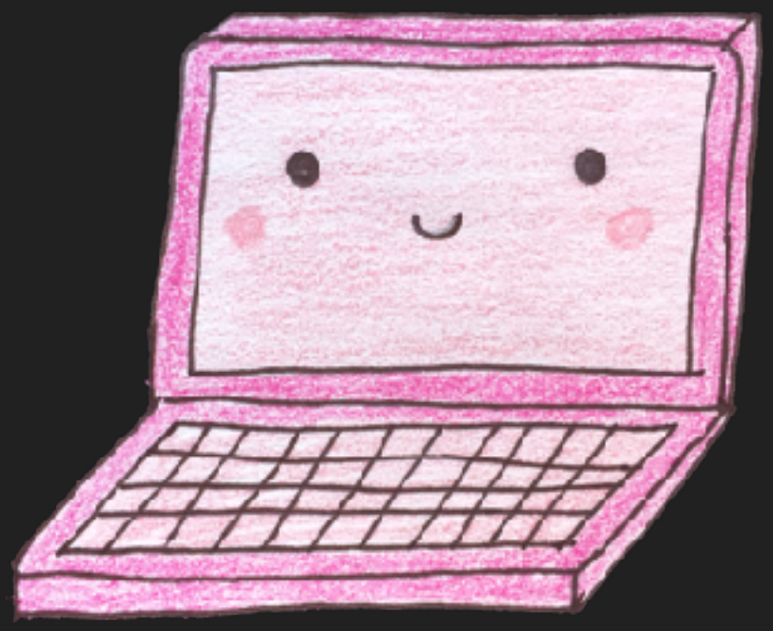
'Cause I'm on the network
getting packets
Server's sending me three-
hundred and five
♪♪♪



Alanis Morisette - Hand in my Pocket

how do websites?

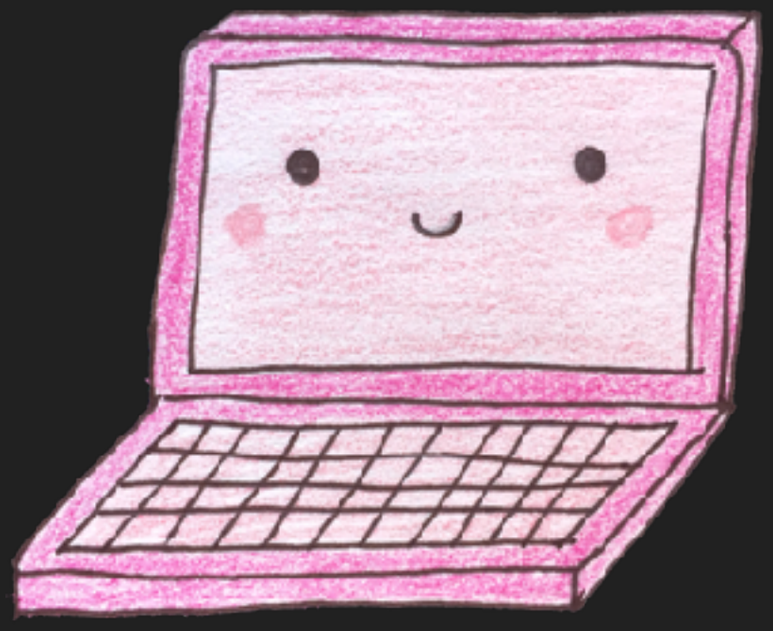
The bigger you send,
The harder you fall
Take it from me, girl,
You gotta start small
♪♪♪



The Supremes & The Four Tops - The Bigger You Love, The Harder You Fall

how do websites?

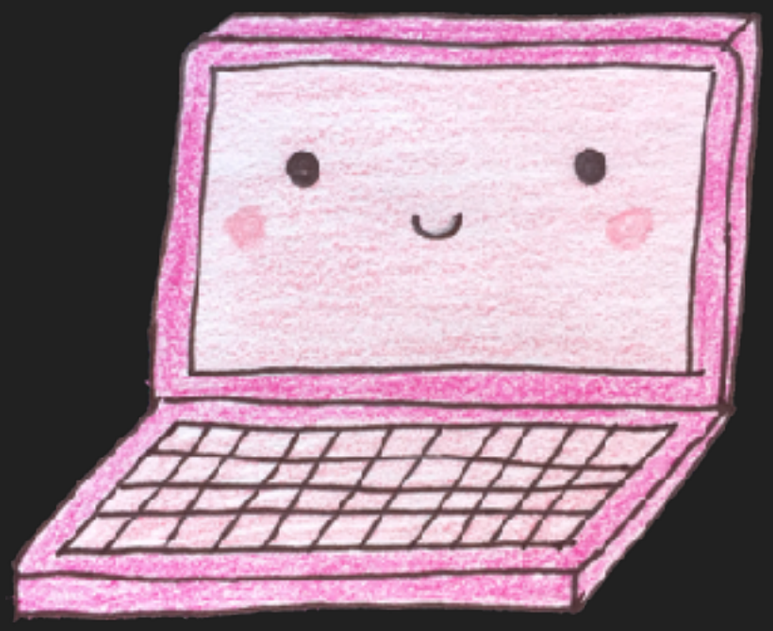
We did everything right,
Bytes are on the client side
♪♪♪



Calvin Harris ft. Ellie Goulding - Outside

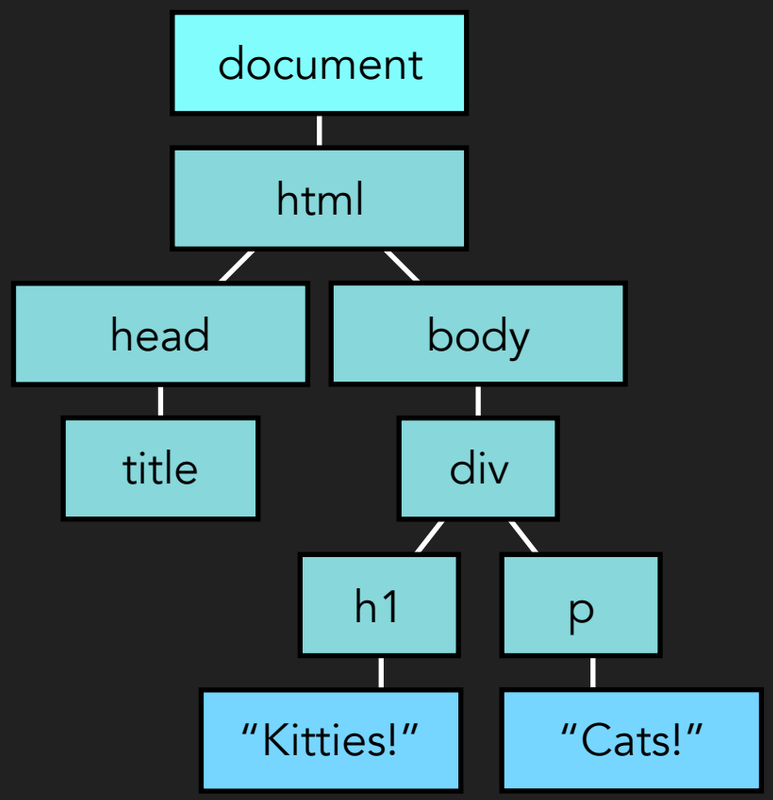
how do websites?

Are you listening?
(Whoa-oh-oh-oh-oh)
Please come back.
(Whoa-oh-oh-oh-oh)
I'll tell you what do I need
I'll tell you what do I need
Whoa-oh, whoa-oh
♪♪♪

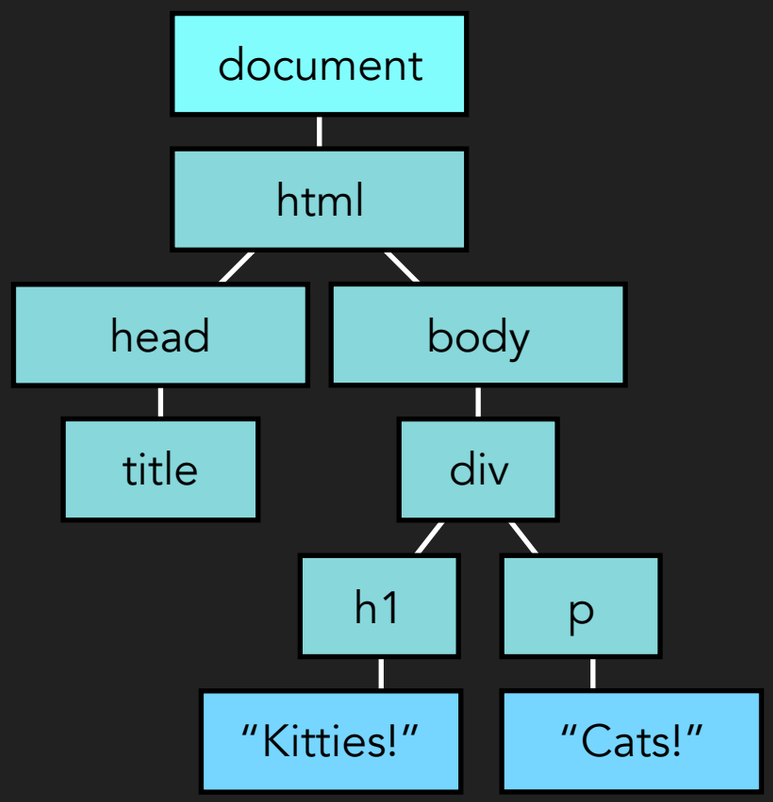


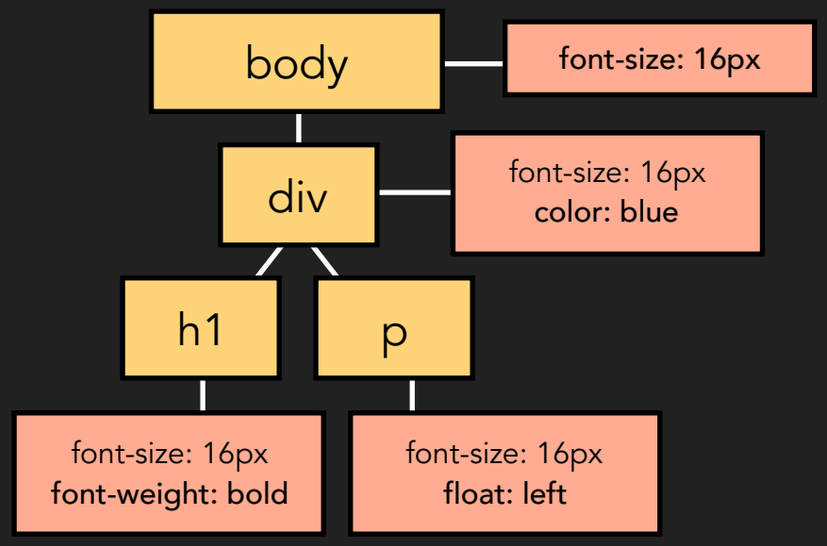
Jimmy Eat World - Sweetness

how do websites?

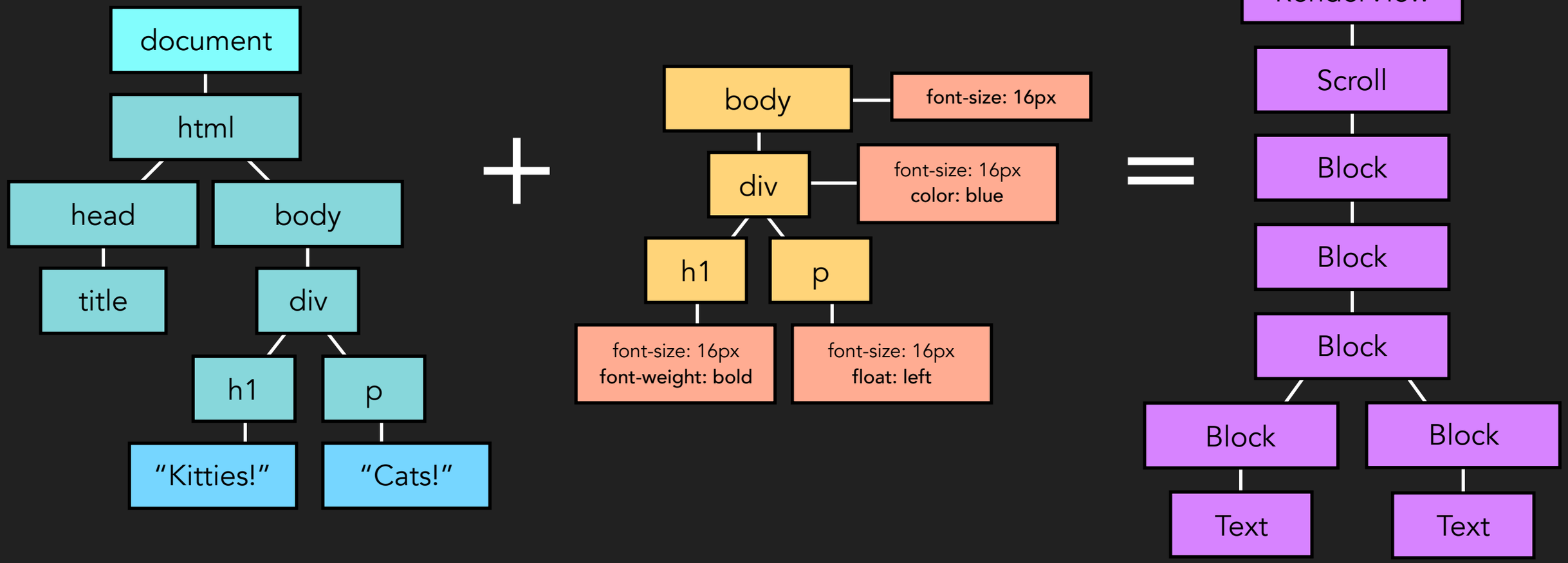


how do websites?





how do websites?



keep
things
small

keep things small

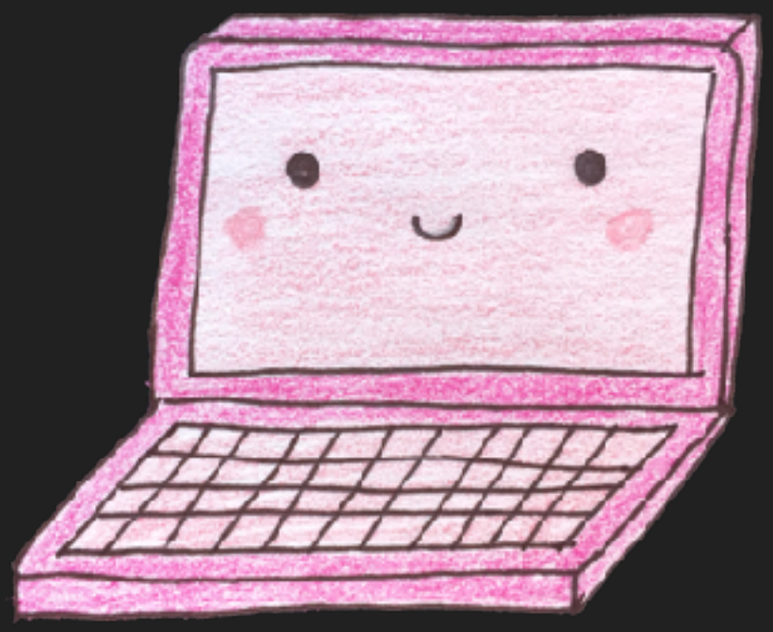
Harder, Better,
Faster, Smaller
♪♪♪

Daft Punk - Harder, Better, Faster, Stronger

keep things small

minify your html, css, and js

Got some files to send over
And their length's inflamed
Remove the whitespace, baby
It'll up your game
♪♪♪



Taylor Swift - Blank Space

keep things small

minify your html, css, and js

```
var array = [];

for (var i = 0; i < 20; i++) {
   array[i] = i;
}
```

https://en.wikipedia.org/wiki/Minification_(programming)

keep things small

minify your html, css, and js

```
for(var a=[i=0];++i<20;a[i]=i);
```

https://en.wikipedia.org/wiki/Minification_(programming)

keep things small

compress your html, css, and js

Shrink it down,
gzip it
(Don't reverse it…)
♪♪♪

Missy Elliot - Work It

keep things small

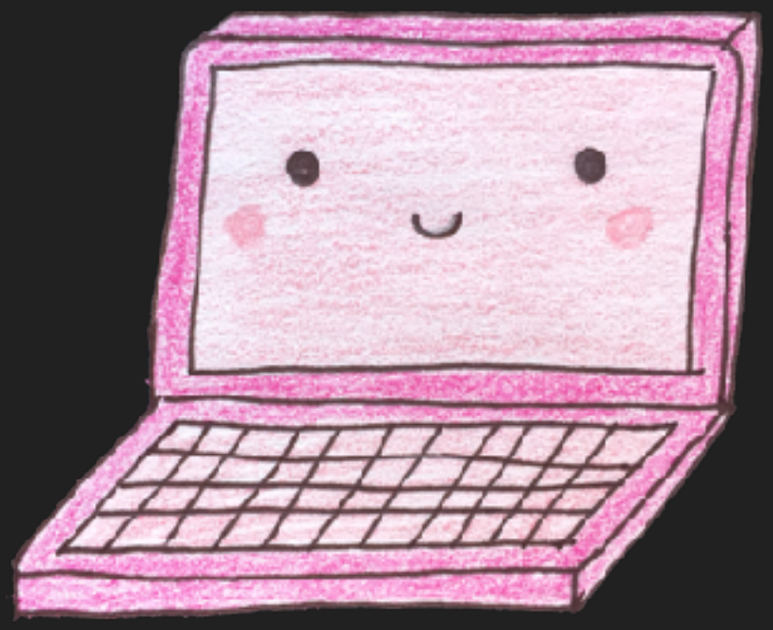
compress your html, css, and js

C031M2YLA/ /messages	GET	200	43.4 KB 176 KB	🔥
modern.vendor.8fe556b.min.css a.slack-edge.com/bv1-6	GET	200	53.2 KB 340 KB	🔥
application.10d5ac2.min.css a.slack-edge.com/bv1-6	GET	200	40.9 KB 253 KB	🔥
modern.vendor.965584b06b8c78ee54e7.min.js a.slack-edge.com/bv1-6	GET	200	1.6 MB 6.9 MB	🔥
application.0678883039714b0d6b51.min.js a.slack-edge.com/bv1-6	GET	200	679 KB 2.8 MB	🔥
slackbot_192.png a.slack-edge.com/16510/img	GET	200	5.8 KB 5.7 KB	😕
downloads_empty@2x.png a.slack-edge.com/b8a7/img	GET	200	6.0 KB 5.9 KB	😕

keep things small

optimize your images

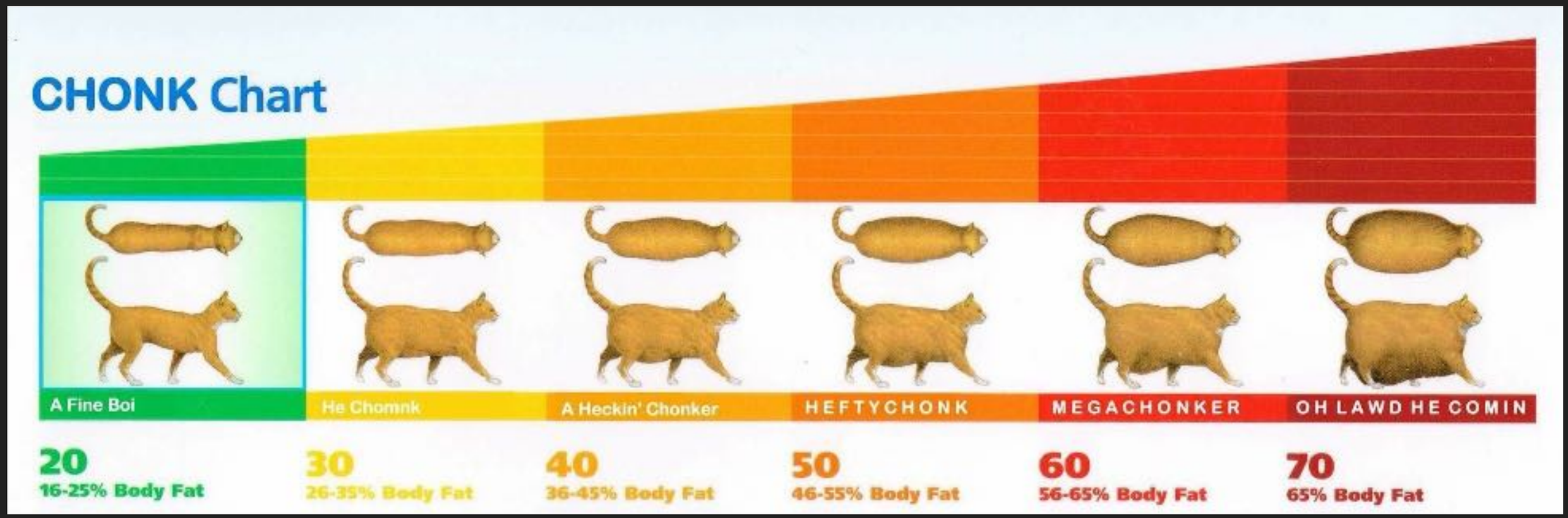
All the small things
What speed this brings!
♪♪♪



Blink 182 - All the Small Things

keep things small

optimize your images



https://imgur.com/gallery/FmTnf7e

keep things small

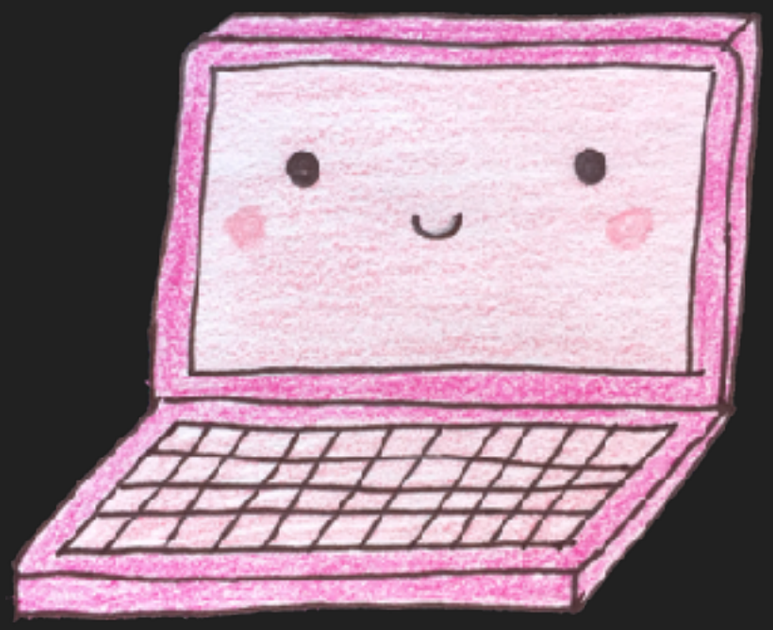
optimize your images

tinyjpg.com

keep things small

optimize your images

JPEG, I really wanna
Be with you
'Cause you just my type
Ooh, na, na, na, na
♪♪♪

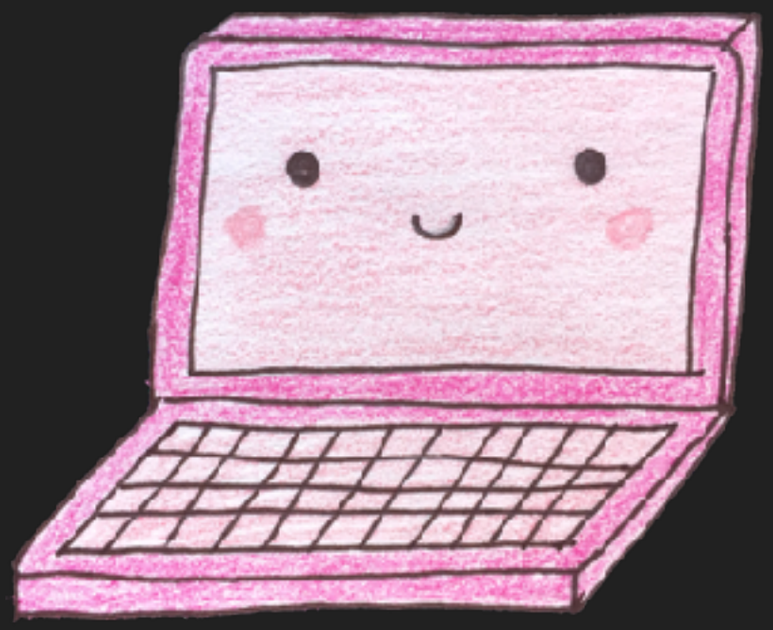


Rihanna ft. Drake - What's my Name

keep things small

optimize your images

The picture is far too
big to look at kid
Your screen's just not
wide enough
♪♪♪



Bright Eyes - The Big Picture

keep things small

optimize your images

```
<img
  srcset="miso-320w.jpg 320w,
          miso-480w.jpg 480w,
          miso-800w.jpg 800w"
  sizes="(max-width: 320px) 280px,
         (max-width: 480px) 440px,
         800px"
  src="miso-800w.jpg"
  alt="Miso, a big, red cat">
```

keep things small

optimize your images

```
<picture>
  <source
    media="(max-width: 799px)"
    srcset="miso-480w-close-portrait.jpg">
  <source
    media="(min-width: 800px)"
    srcset="miso-800w.jpg">
  <img
    src="miso-800w.jpg"
    alt="Miso, a big red cat">
</picture>
```

keep things small

caching

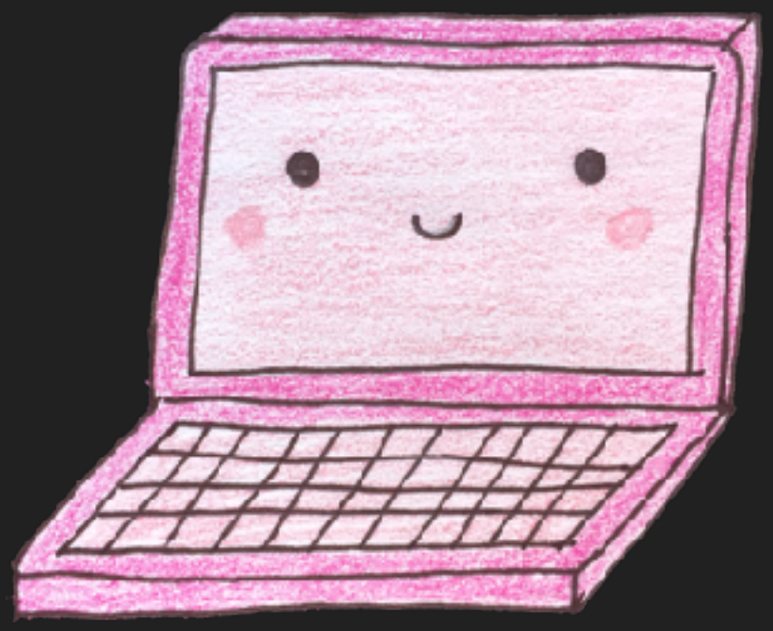
Guess they had to change that code
Updated that file
Which then changed its number
So I need the new stuff though
Now it's just some page
That I used to know
♪♪♪

Gotye - Somebody That I Used To Know

keep things small

caching

Pull it down, I'm yelling timber
Unless it moves or gets enhanced
This data, I’m told to remember
Until it tells me to forget
♪♪♪



Pitbull ft. Ke$ha - Timber

keep things small

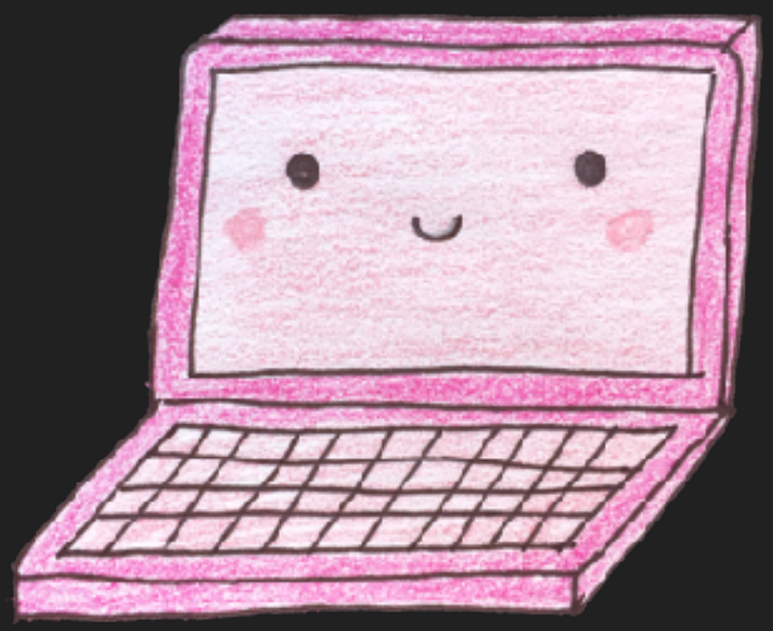
caching

There's no
Deliver-iver-iverace
If it doesn't
Ever, ever change
♪♪♪

CHVRCHES - Deliverance

keep things small

only include *necessary* files



Well I know that
I'll get through this
'Cause I know that I am smart
I don't need you anymore
I don't need you anymore
I don't need you anymore
No I don't need you anymore…
♪♪♪

Cher - Believe

keep things small

only include *necessary* files

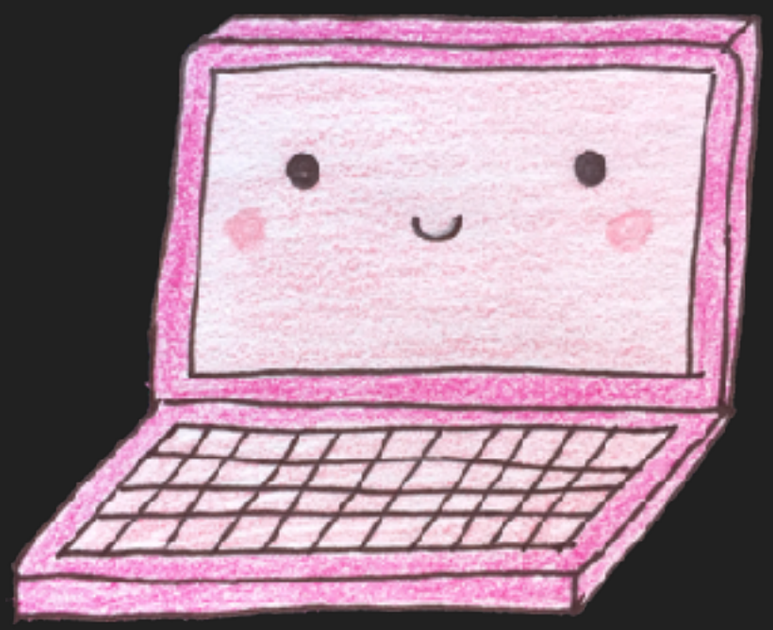
```
import _ from 'lodash';
```

```
import {
  debounce,
  values,
} from 'lodash'
```

keep things small

only include *necessary* files

Shake it, shake it, shake it,
Shake it, shake it, shake it,
Shake it, shake it, shake it
Shake it like a JavaScript bundle
Hey ya!
♪♪♪

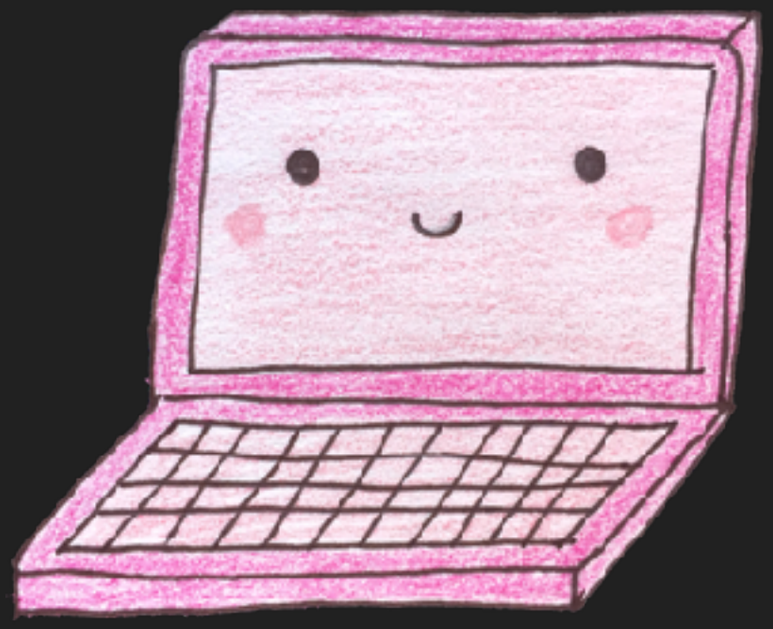


OutKast - Hey Ya

keep things small

optimize fonts

Baby I don't need fancy glyphs
To have a good site
(Yay system fonts!)
♪♪♪

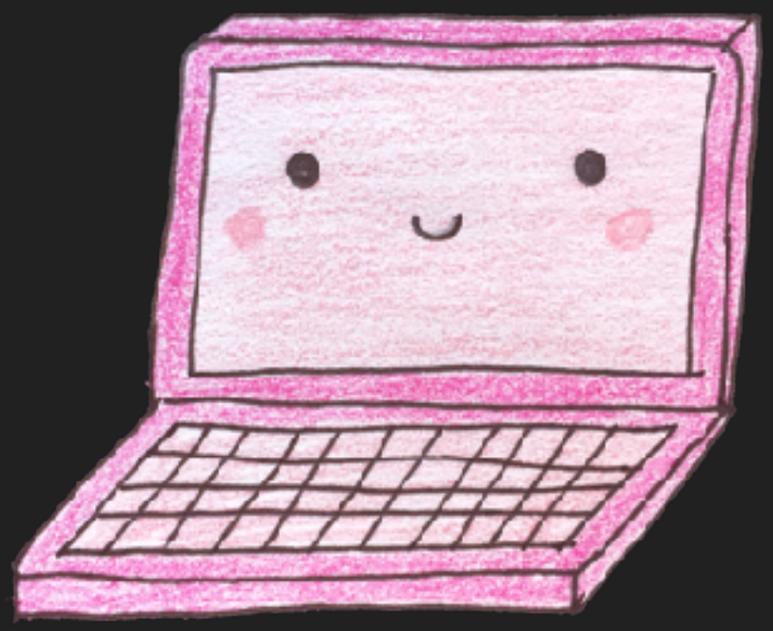


Sia - Cheap Thrills

keep things small

put your assets in a cdn

I feel so close to you right now
♪♪♪



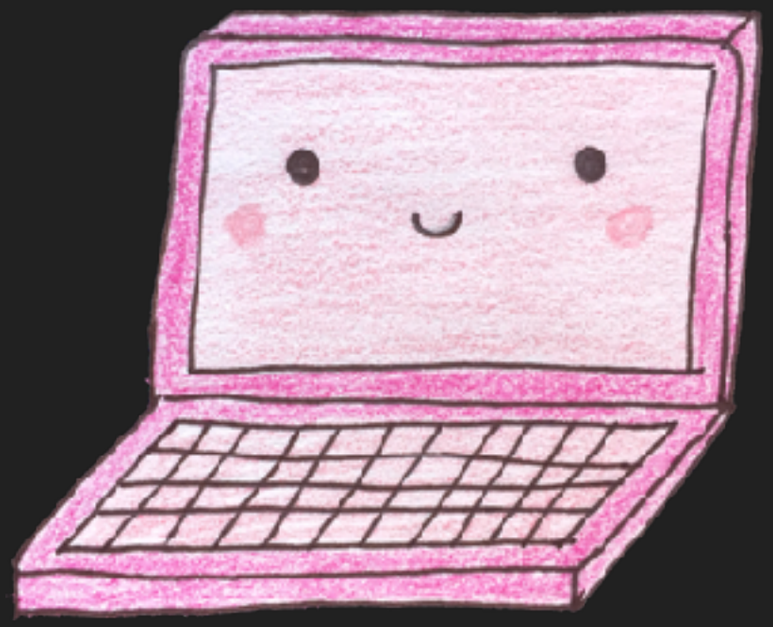
Calvin Harris - Feel So Close

keep
things
smart

keep things smart

concatenate your css and js

Come together, right now
Up the speed
♪♪♪

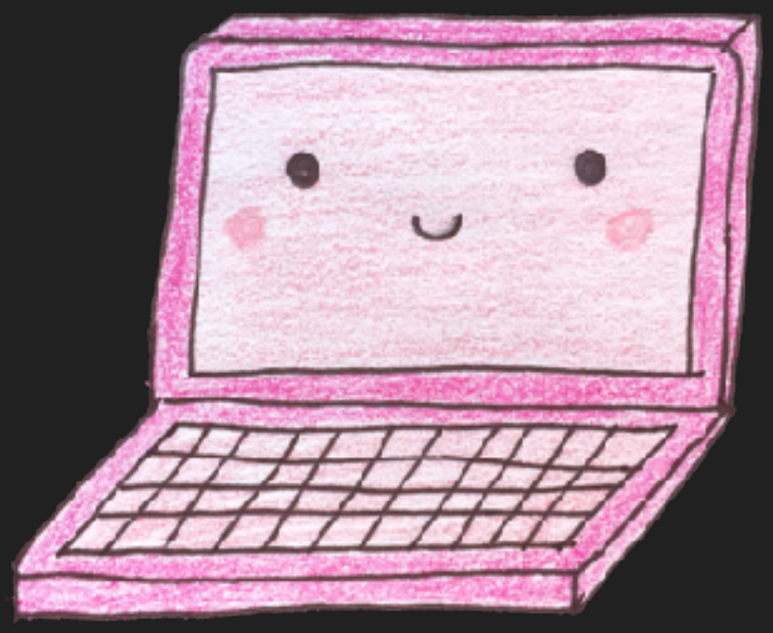


The Beatles - Come Together

keep things smart

use image sprites and icon fonts

Yeah, it's always better
When they're together
♪♪♪

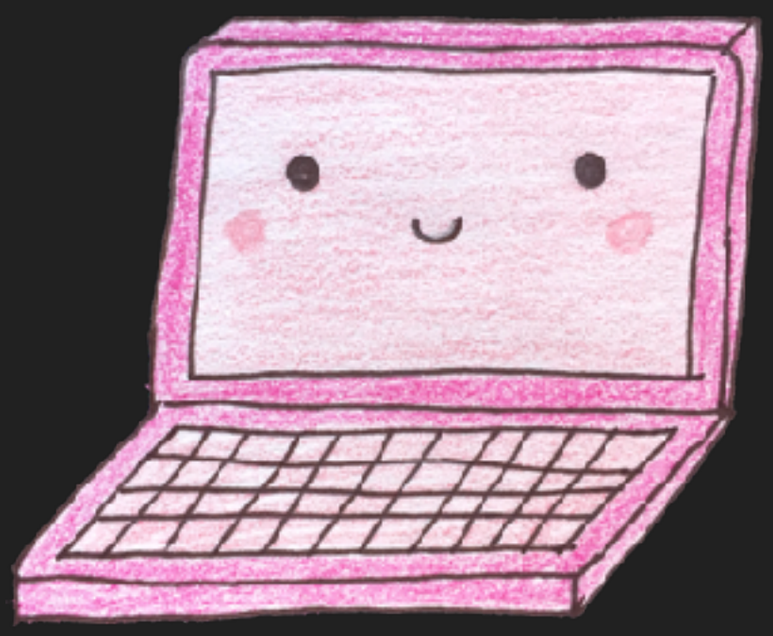


Jack Johnson - Better Together

keep things smart

domain sharding

Are we breaking up?
(Breaking up)
Are we breaking up?
(Breaking up)
Is there a different subdomain
Between you and I?
♪♪♪

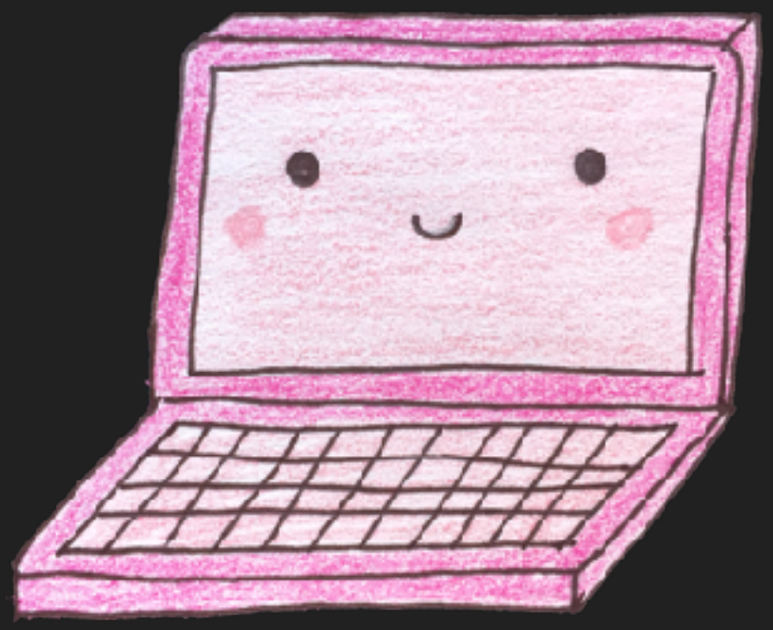


Rilo Kiley - Breaking Up

keep things smart

make js non-blocking

Scripts go at the bottom
Not up here
Scripts go at the bottom
So the whole page freakin' here
♪♪♪

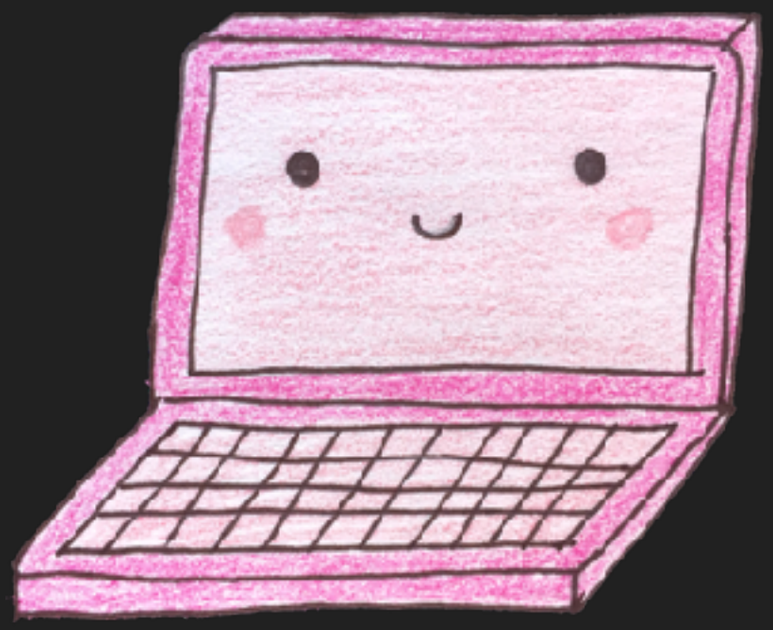


Drake - Started from the Bottom

keep things smart

make js non-blocking

So I don’t take the fall
Of a document.write call
When I see you, everything stops
Never put the scripts on top
♪♪♪

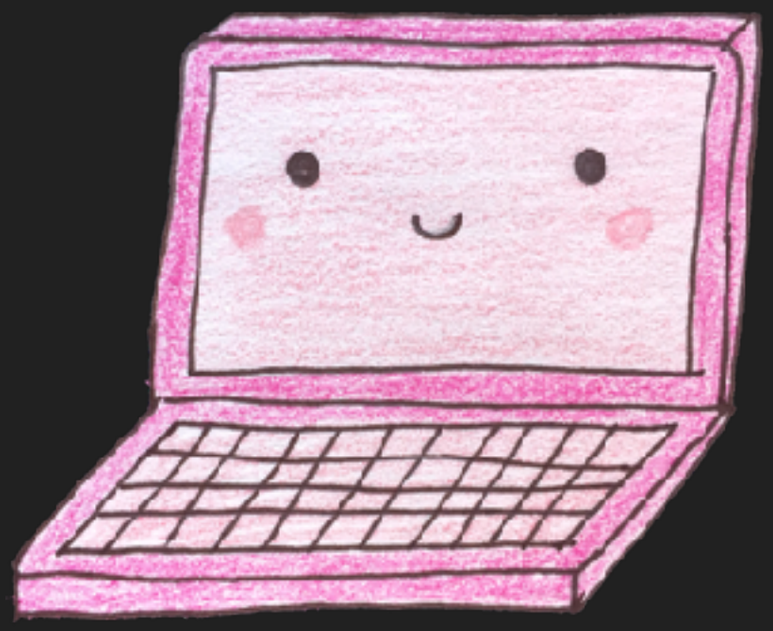


Beyoncé - Love on Top

keep things smart

make js non-blocking

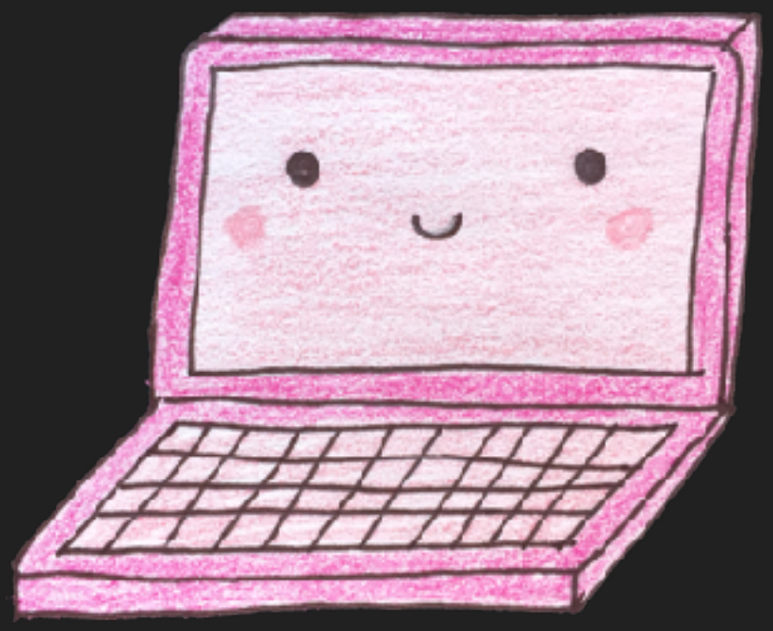
We can't stop…
♪♪♪



Miley Cyrus - Can't Stop

keep things smart

make js non-blocking



And we won't stop…
♪♪♪

Miley Cyrus - Can't Stop

keep things smart

make js non-blocking

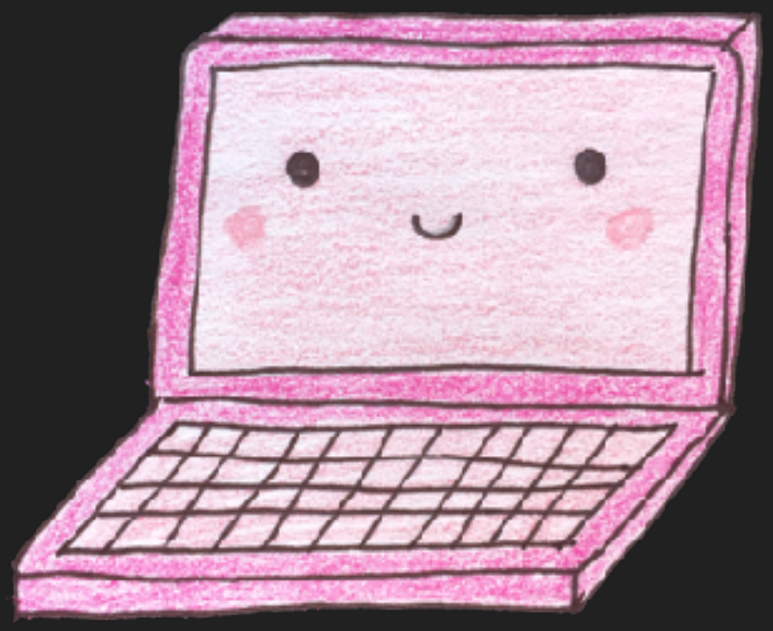
```
<head>
  <script defer src="lib.js"></script>
  <link href="styles.css">
</head>
```

```
<head>
  <script async src="lib.js"></script>
  <link href="styles.css">
</head>
```

keep things smart

make js non-blocking

But yeah does it feel so good
'Cause I get scripts when
I want them now
And if you could
Then you know you would
'Cause yeah it just feels so
It just feels so good
♪♪♪



Paramore - Misery Business

keep things smart

put css at the top

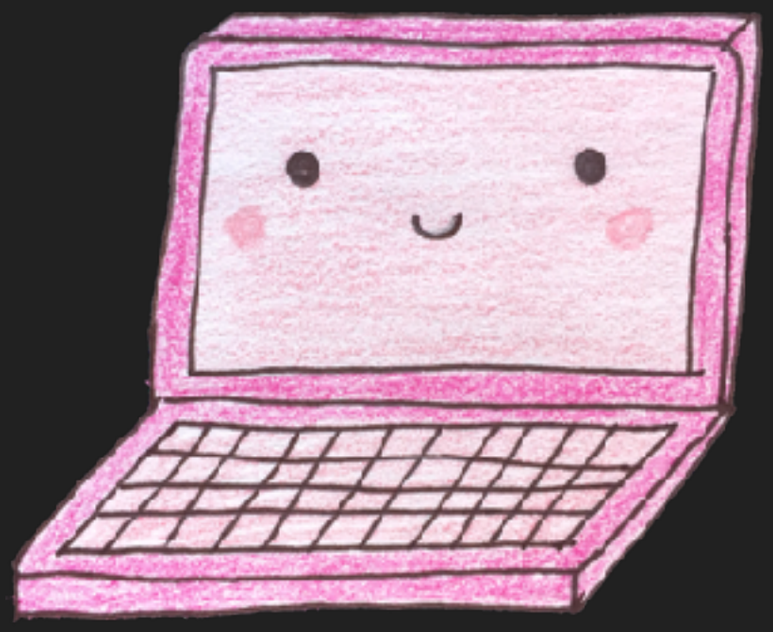
In your <head>
In your <head>
Stylesheet, stylesheet,
eet, eet, eet
♪♪♪

The Cranberries - Zombie

keep things smart

put css at the top

Critical styles inlined
To keep this page load streamlined
♪♪♪



Taking Back Sunday - Cute Without the E (Cut From the Team)

keep things smart

use http/2

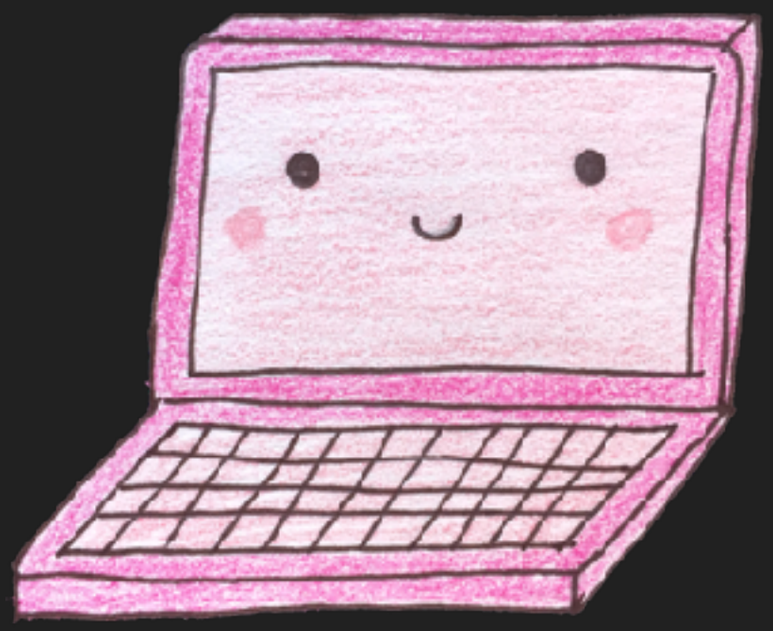
How you gonna upgrade me?
What's higher than
One point one?
♪♪♪

Beyoncé - Upgrade U

keep
things
smooth

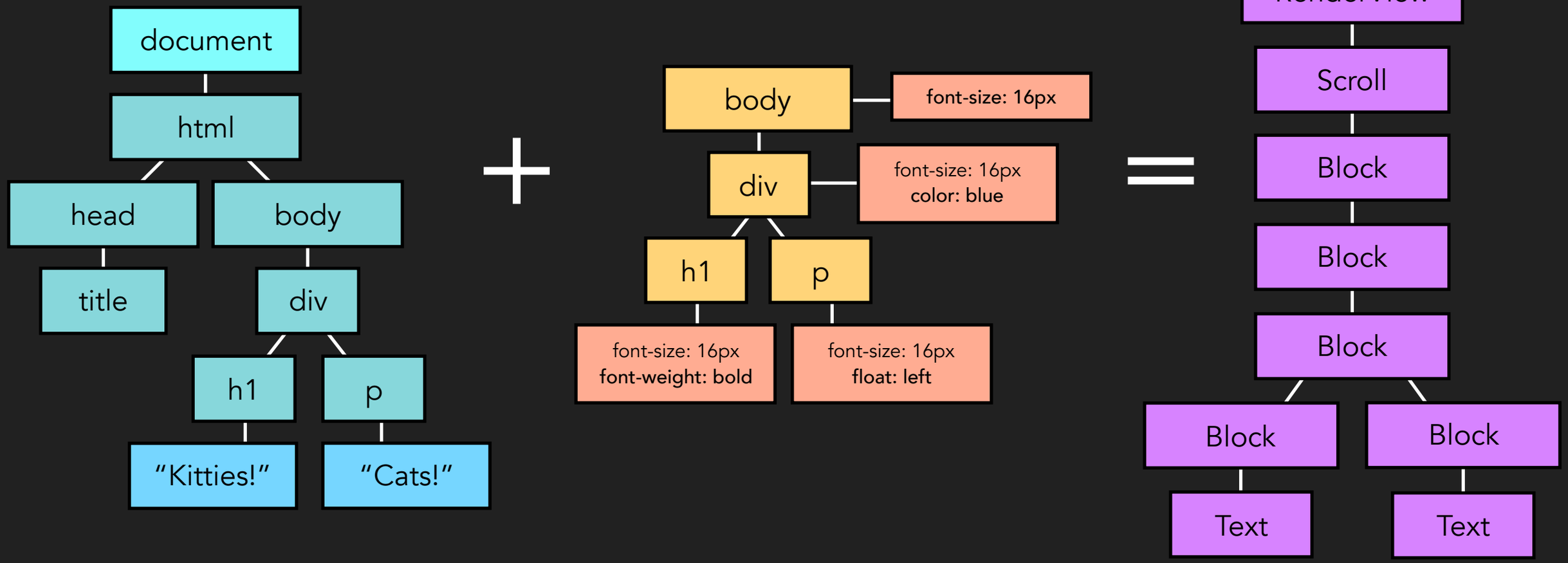
keep things smooth

You got the kind of scrollin'
That can be so ~smooth~, yeah
Get rid of jank, make it real
Or else forget about it
♪♪♪



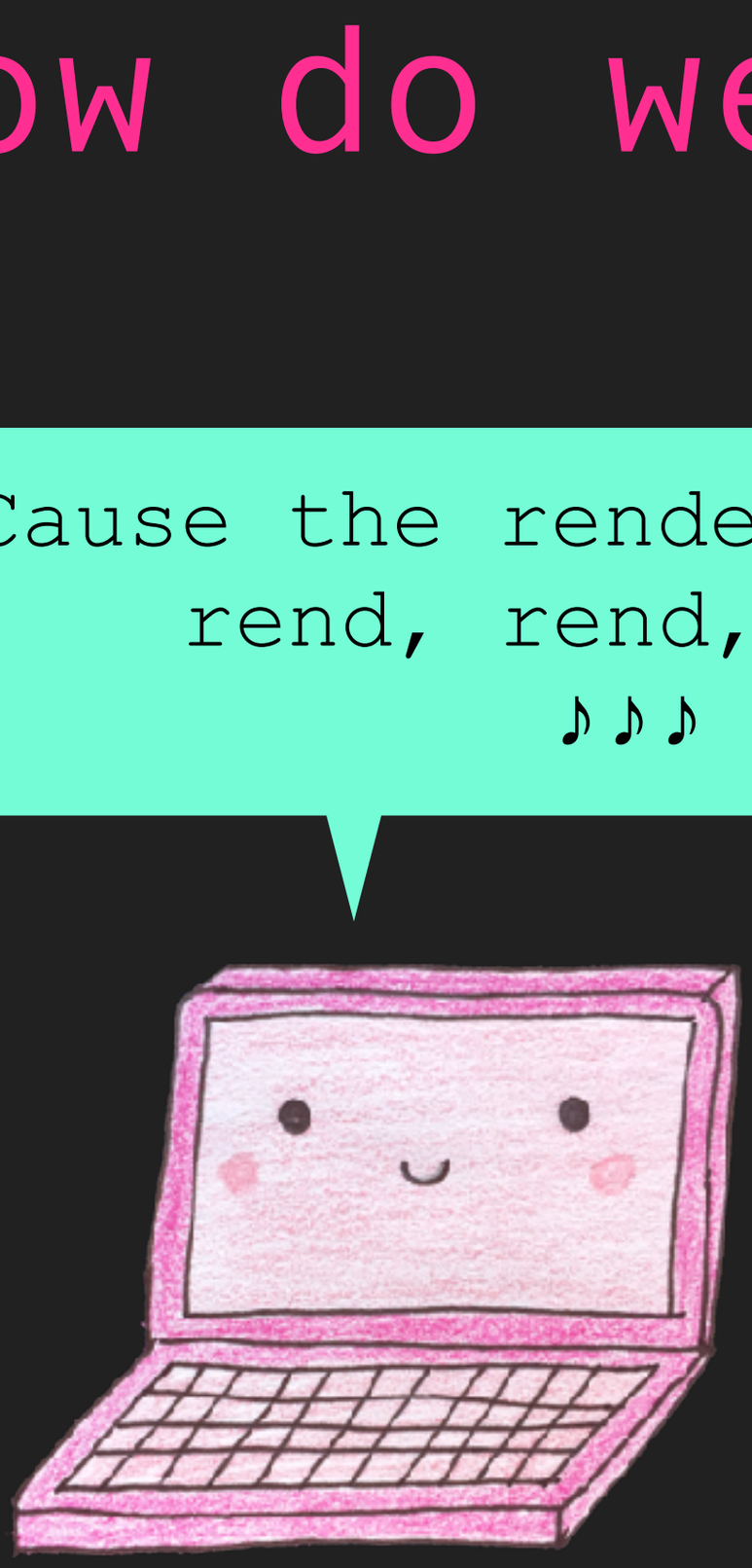
Santana ft. Rob Thomas - Smooth

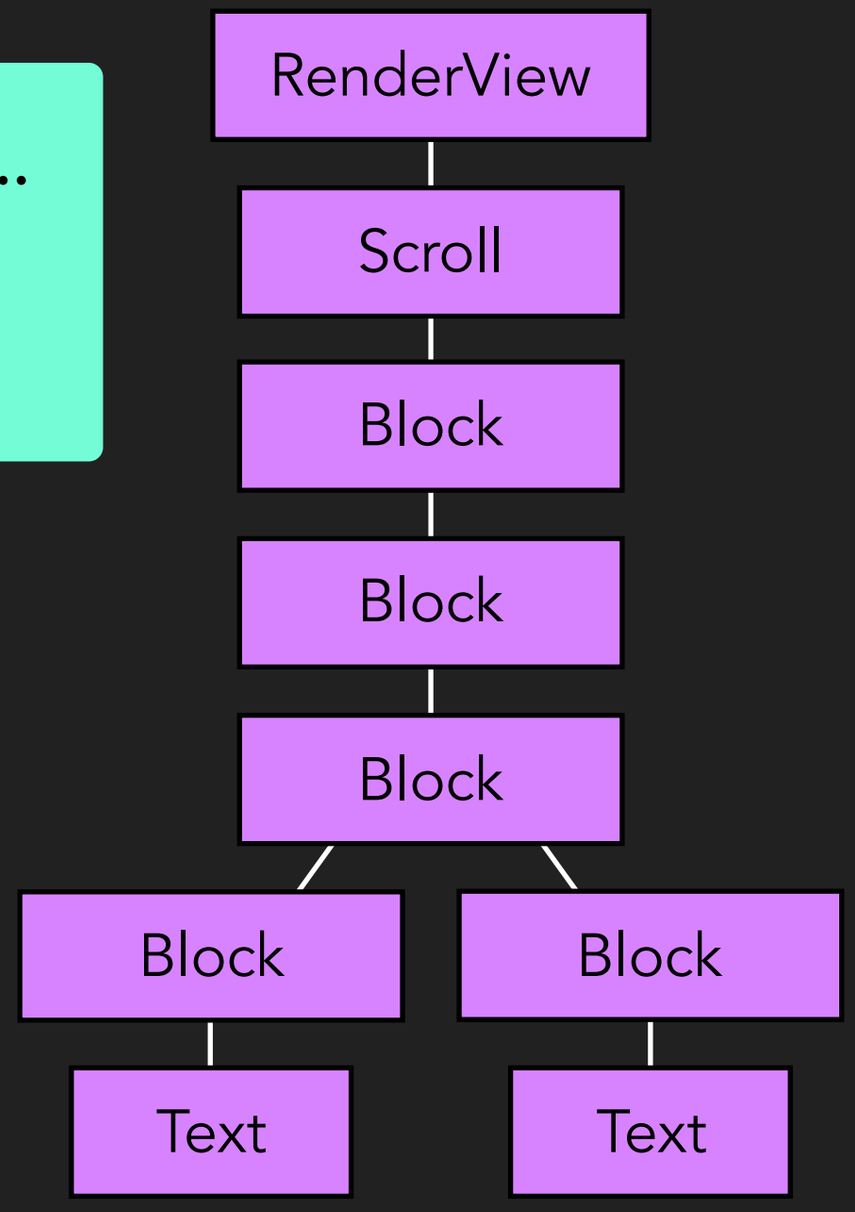
how do websites part 2



how do websites part 2

Cause the render's gonna…
rend, rend, rend?
♪♪♪

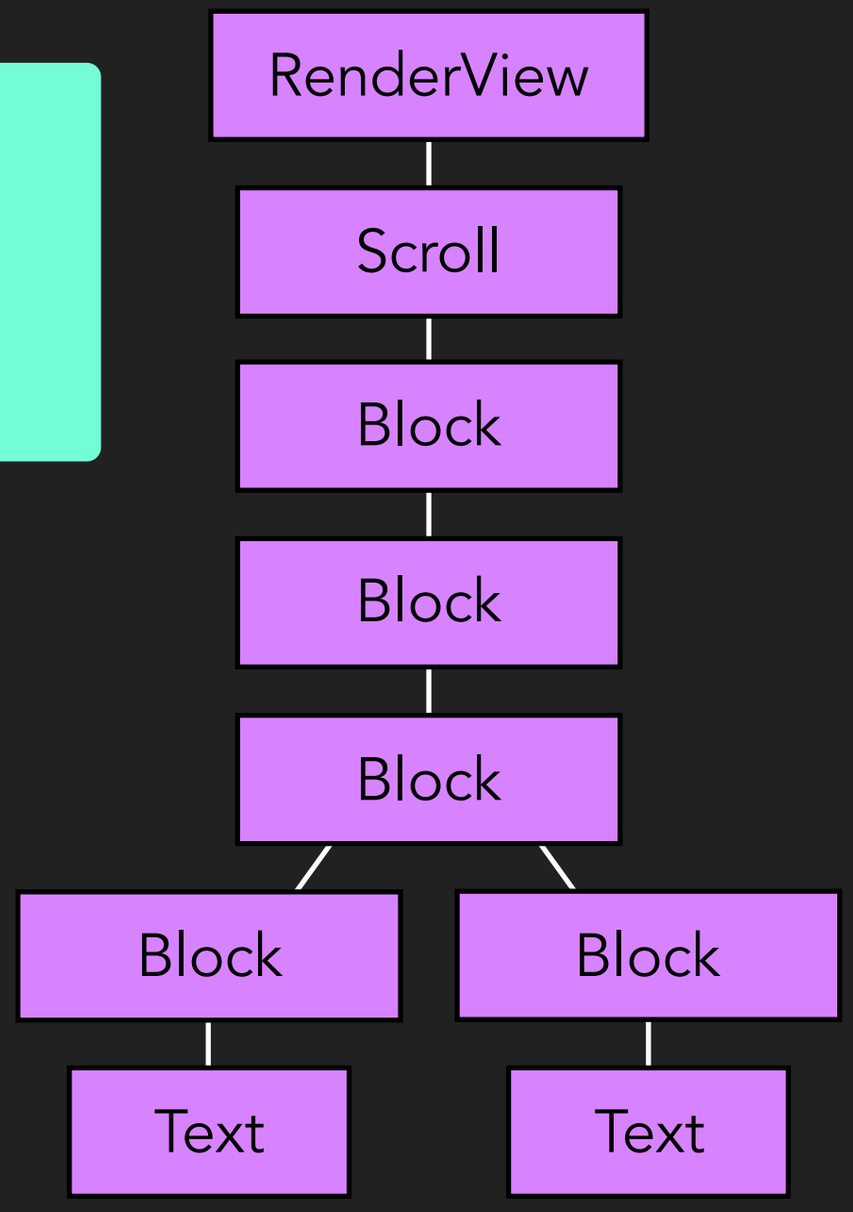




Taylor Swift - Shake it Off

how do websites part 2

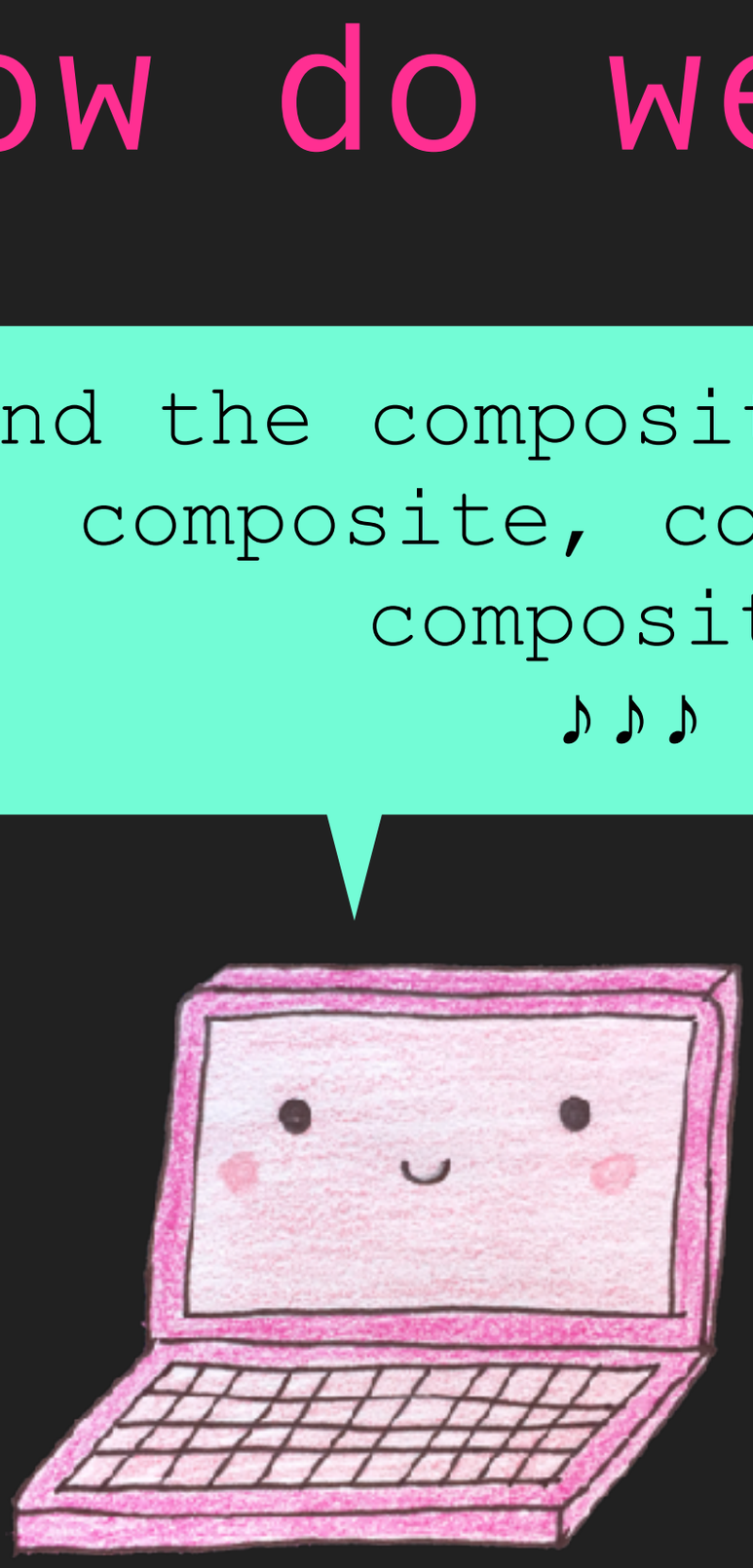
And the painter's gonna paint, paint, paint…
♪♪♪

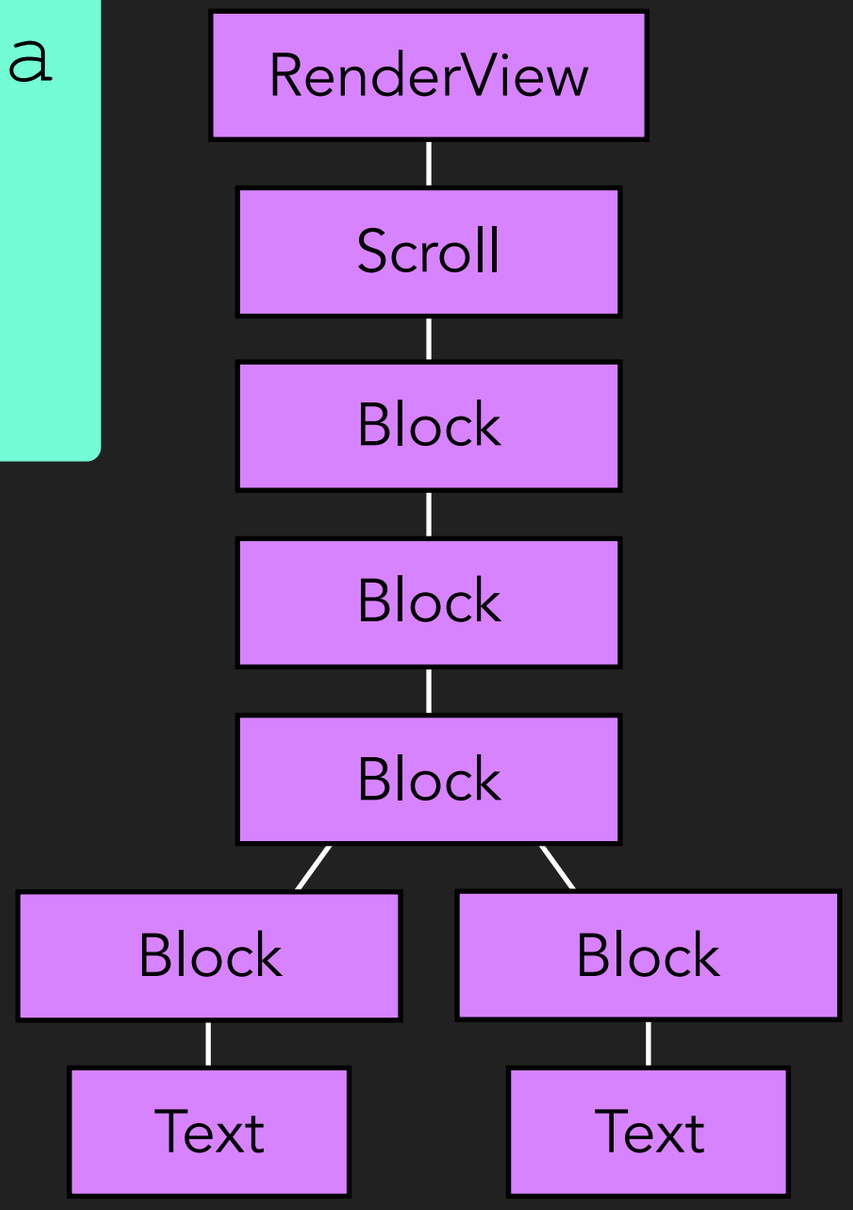


Taylor Swift - Shake it Off

how do websites part 2

And the compositor's gonna composite, composite, composite…
♪♪♪





Taylor Swift - Shake it Off

how do websites part 2

Do it allll agaaaain
♪♪♪

Katy Perry - Last Friday Night (T.G.I.F.)

how do ~~websites~~ brains

Every frame you forsake
Every move you make
Every time you break
Every paint you take
I'll be watching you
♪♪♪

The Police - Every Breath You Take

how do websites part 2

Layout → Painting → Compositing

this. sick. feat.
♪♪♪

Taylor Swift - Shake it Off

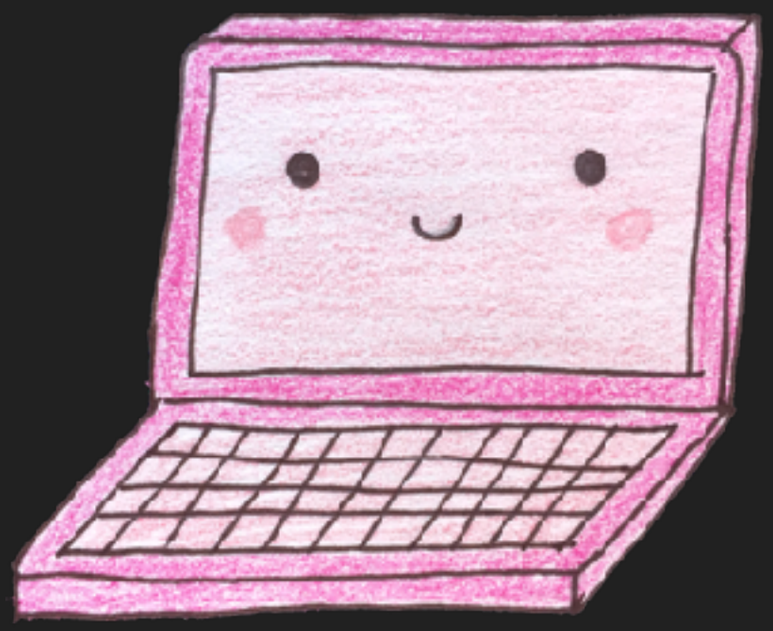
how do websites part 2

Loop loop ba-doop loop ba-doop
Loop ba-doop ba-doop
Ba-doop loop ba-doop loop
Ba-doop loop ba-doop, ba-doop,
ba-doop
♪♪♪

Salt-N-Pepa - Shoop

how do websites part 2

Here’s to never ending circles
And building them on top of me
And here's to another no, then
You won’t get a render
You won’t get a render
♪♪♪

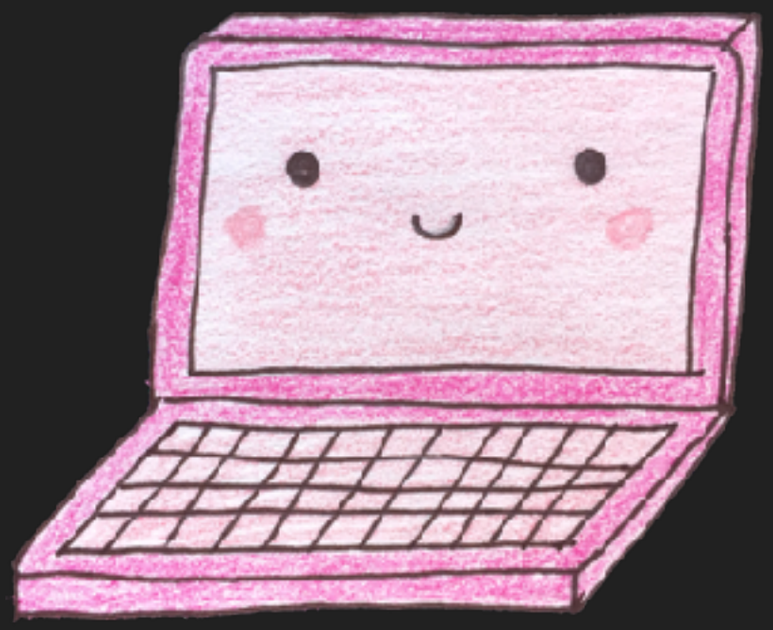


CHVRCHES - Never Ending Circles

keep things smooth

debounce or throttle inputs

Debouncing all the calls again
Whoa-oh!
♪♪♪



Sugarcult - Bouncing off the Walls Again
https://css-tricks.com/debouncing-throttling-explained-examples/

keep things smooth

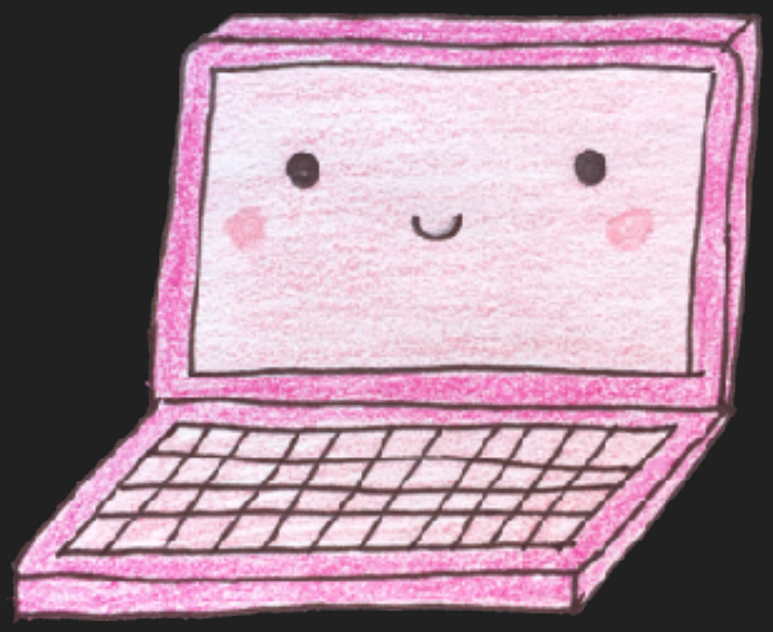
debounce or throttle inputs

```
import { debounce } from 'lodash';


this.onUserInput =
  debounce(this.onUserInput,100);
```

keep things smooth

use requestAnimationFrame

Baby, I'm not always
There when you call,
But I'm always on time
And I gave you my all,
Now baby, be mine
♪♪♪



Ja Rule ft. Ashanti - On Time

keep things smooth

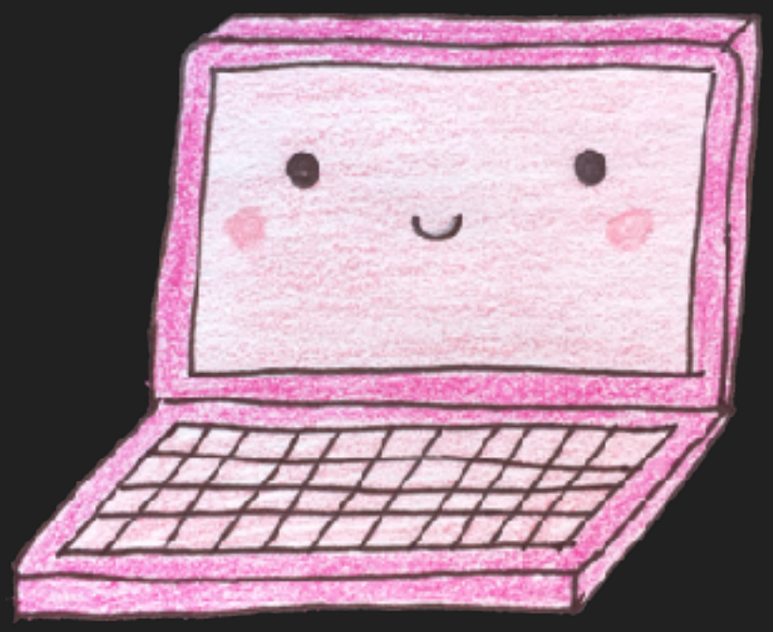
use requestAnimationFrame

```
window.addEventListener('resize', (e) => {
   if (this.bottomSpan < window.innerWidth) {
      window.requestAnimationFrame(
         this.drawTriangles.bind(this)
      );
      this.bottomSpan = window.innerWidth;
   }
});
```

keep things smooth

use web workers

Give it away
Give it away
Give it away
Give it away now
♪♪♪

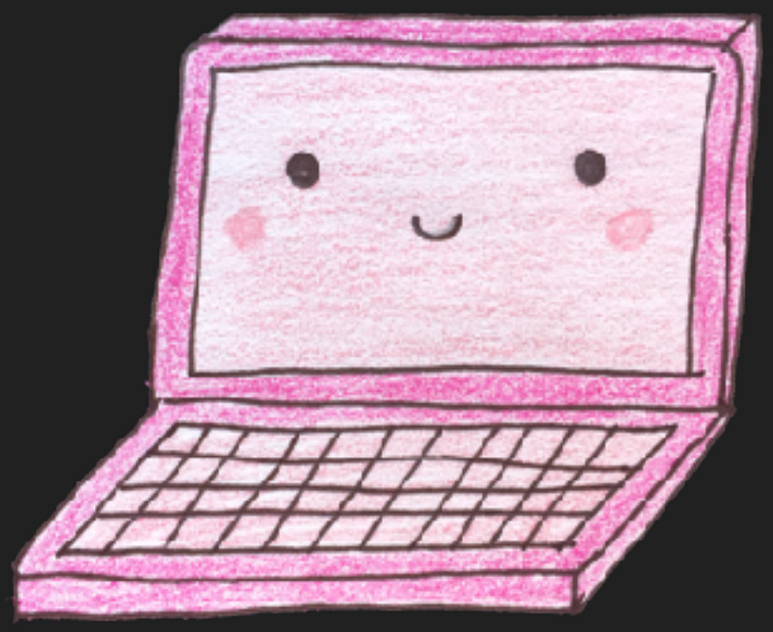


Red Hot Chili Peppers - Give it Away

keep things smooth

use web workers

When what you have
Will take too long
Move along, move along
Like I know you do
♪♪♪

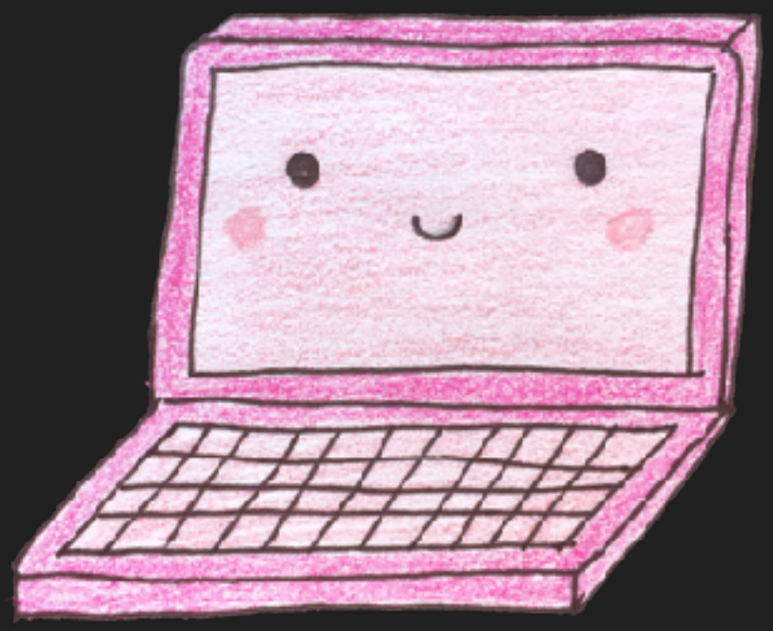


The All-American Rejects - Move Along

keep things smooth

animate with transform + opacity

I, I, I, I, I, I
Know how to transform
I transform, I transform
I'm a transformer
I, I, I, I, I, I
Know how to transform
I transform (I can do it!)
I'll transform (I can do it!)
I'm a transformer
♪♪♪



Gnarls Barkley - Transformer

keep things smooth

animate with transform + opacity

```
.zoomy {
  position: absolute;
  top: 100px;
  left: 30px;
  width: 100px;
  height: 100px;

  animation: move 3s ease infinite;
}

@keyframes move {
  50% {
     top: 200px;
     left: 130px;
  }
}
```

https://codepen.io/chriscoyier/pen/pBCax

keep things smooth

animate with transform + opacity

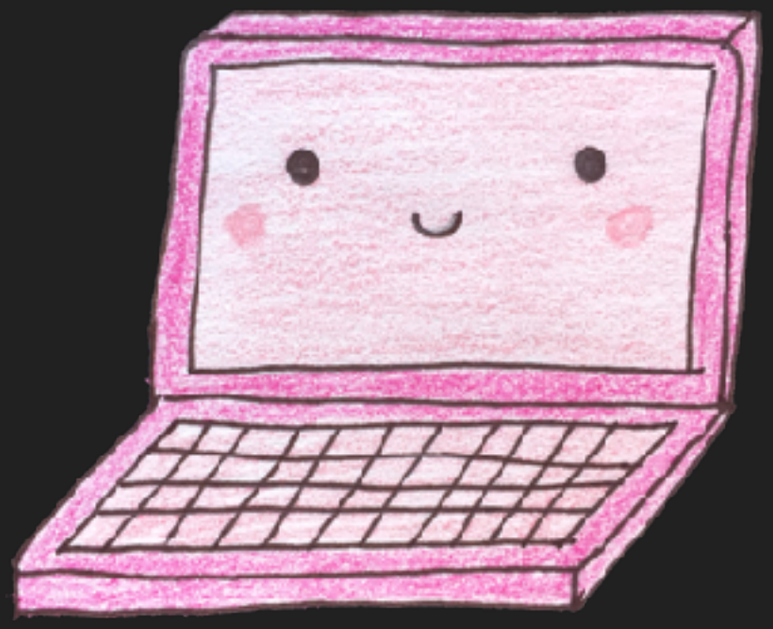
```
.zoomy {
  position: absolute;
  top: 100px;
  left: 30px;
  width: 100px;
  height: 100px;

  animation: move 3s ease infinite;
}

@keyframes move {
  50% {
     transform: translate(100px, 100px);
  }
```

Https://codepen.io/chriscoyier/pen/kyctm

keep things smooth

animate with transform + opacity

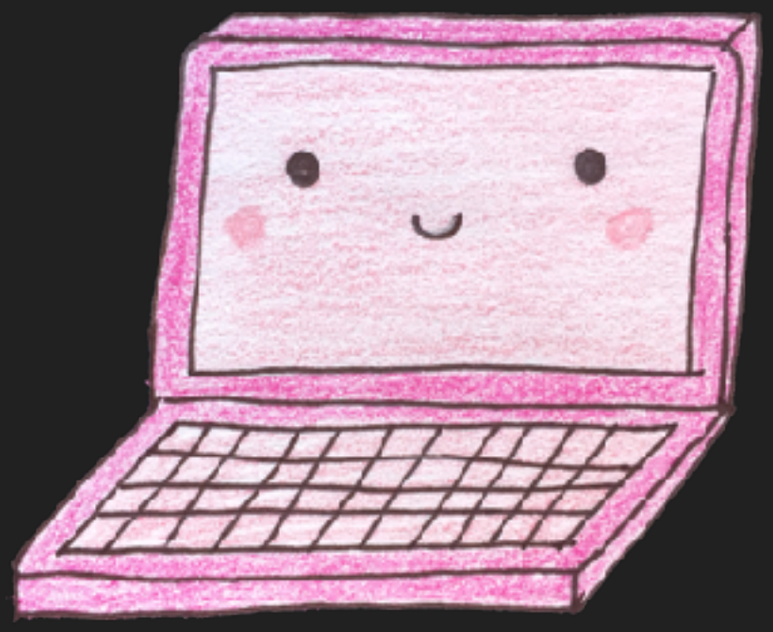
Layout → Painting → Compositing



keep things smooth

use a css methodology

CSS, take it easy
For there is something
that we can do.
CSS, take it easy
BEM it for me
Or BEM it for you.
♪♪♪



Mika - Relax, Take it Easy

keep things smooth

use a css methodology

```
.box:nth-last-child(-n+1) .title {
  /* styles */
}
```

keep things smooth

use a css methodology

```
.Box_title--special {
  /* styles */
}
```

always
measure
first

always measure first

synthetic measurements

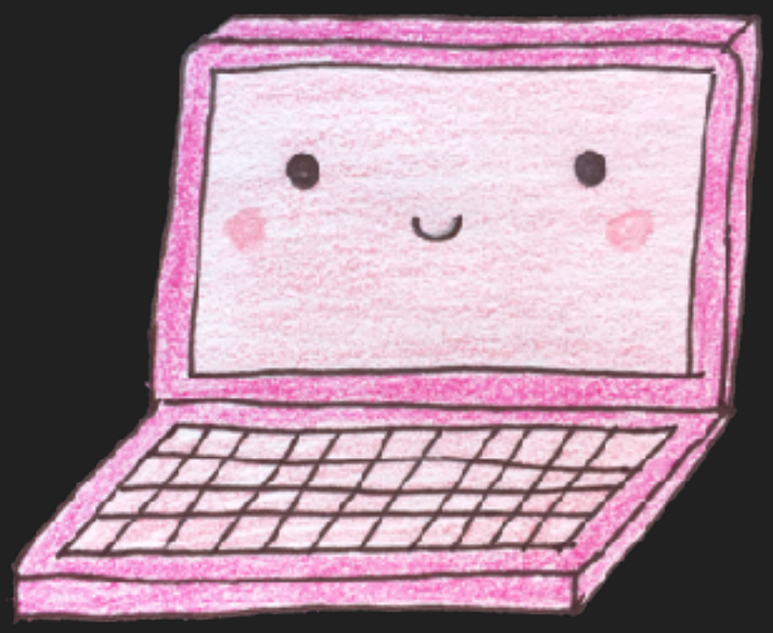
Is someone getting the test,
the test, the test,
the test of you?
♪♪♪

Foo Fighters - The Best of You

always measure first

real user measurements

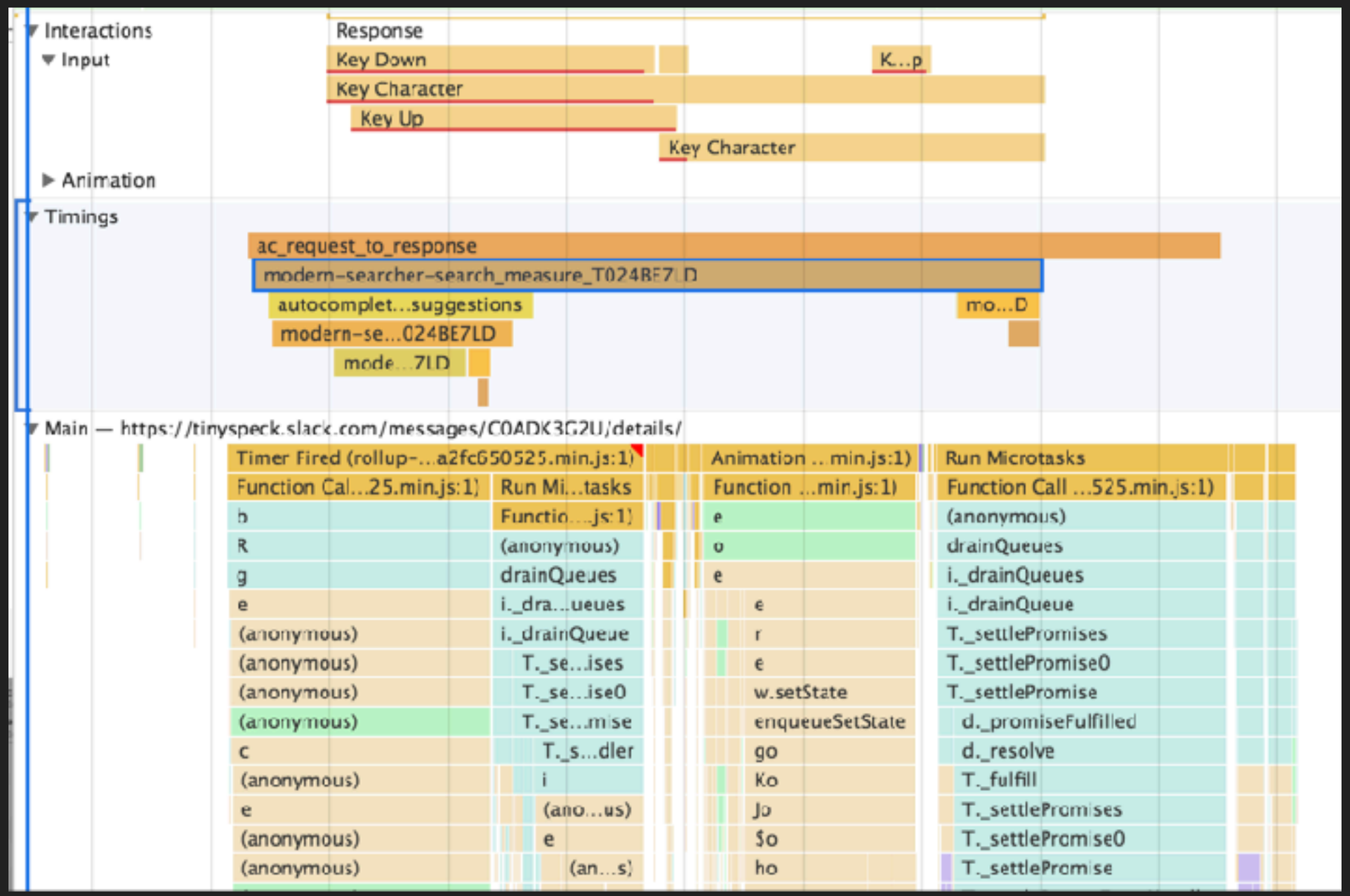
Ain’t it fun
Timing in the real world
Ain’t it good
Testing in their Chrome
♪♪♪



Paramore - Ain't it Fun

always measure first

🔥 personal fave: flamegraphs 🔥



seriously,
always
measure
first

keep things small, keep things smart, keep things smooth

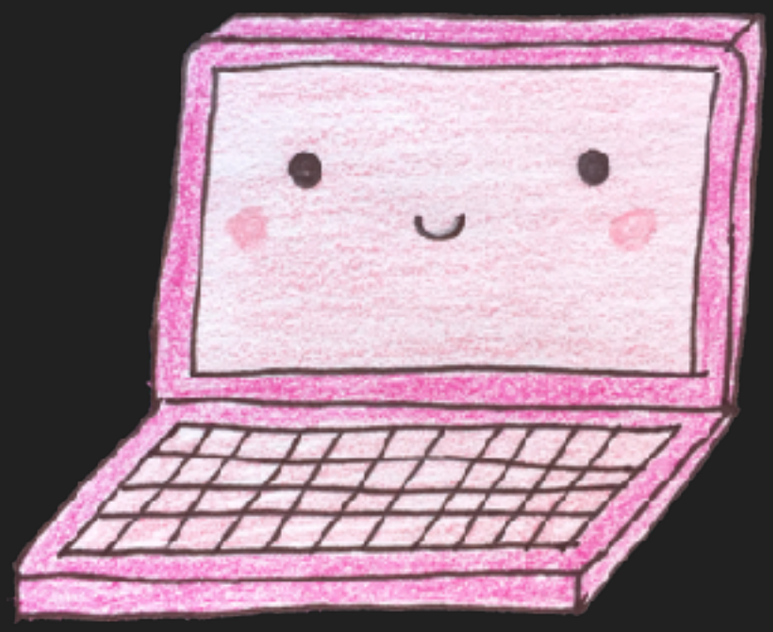
Resources

- Front-End Performance Checklist 2018
- Optimizing the Critical Rendering Path
- Rendering Performance
- Philip Roberts: What the heck is the event loop anyway?
- window.requestAnimationFrame()
- Using Web Workers
- Assessing Loading Performance in Real Life with Navigation and Resource Timing
- Reduce the Scope and Complexity of Style Calculations
- High Performance Browser Networking
- Server Farm to Table, Annotated

Complete Tracklist

Alanis Morissette – Hand in My Pocket
The Supremes & The Four Tops - The Bigger You Love, The Harder You Fall
Calvin Harris ft. Ellie Goulding - Outside
Jimmy Eat World - Sweetness
Daft Punk – Harder, Better, Faster, Stronger
Taylor Swift - Blank Space
Missy Elliot - Work It
Blink 182 - All The Small Things
Rihanna ft. Drake - What's My Name
Bright Eyes - The Big Picture
Gotye - Somebody That I Used To Know
Pitbull ft. Ke$ha - Timber
CHVRCHES - Deliverance
Cher - Believe
OutKast - Hey Ya
Sia - Cheap Thrills
Calvin Harris - Feel So Close
The Beatles - Come Together
Jack Johnson - Better Together
Rilo Kiley - Breaking Up
Drake - Started from the Bottom

something witty about a POP server…



Complete Tracklist

Beyoncé - Love on Top
Miley Cyrus - We Can’t Stop
Paramore - Misery Business
The Cranberries - Zombie
Taking Back Sunday - Cute Without the E (Cut from the Team)
Beyoncé - Upgrade U
Santana ft. Rob Thomas - Smooth
Taylor Swift - Shake it Off
Katy Perry - Last Friday Night (T.G.I.F)
The Police - Every Breath You Take
Salt-N-Pepa - Shoop
CHVRCHES - Never Ending Circles
Sugarcult - Bouncing off the Walls Again
Ja Rule ft. Ashanti - On Time
Red Hot Chili Peppers - Give it Away
The All-American Rejects - Move Along
Gnarls Barkley - Transformer
Mika - Relax, Take it Easy
Foo Fighters - The Best of You
Paramore - Ain't it Fun

Thanks!

jenna.is/at-perfmatters

@zeigenvector