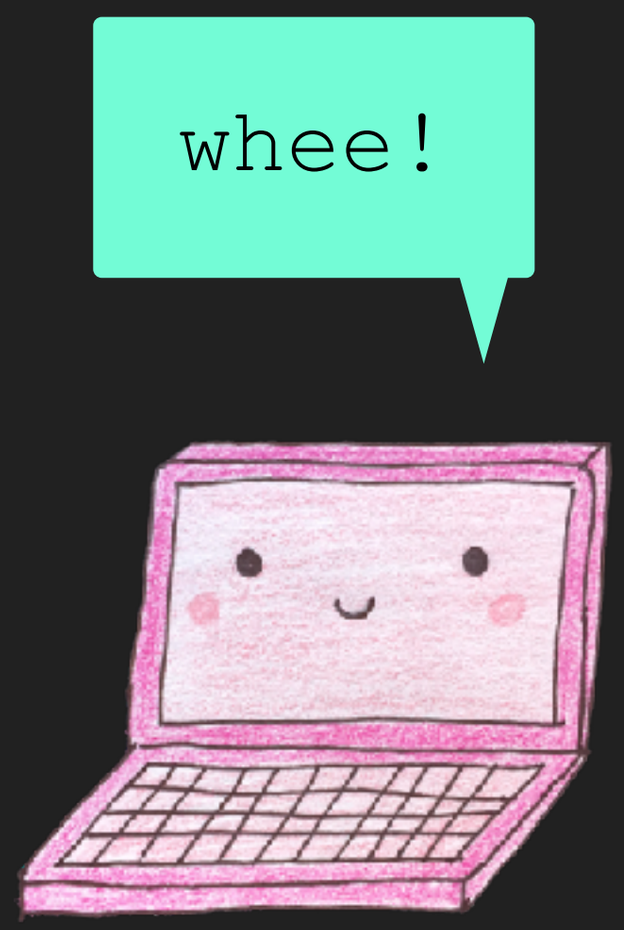
fantastic frontend performance tricks and why we do them



Jenna Zeigen
QCon SF
11/5/18

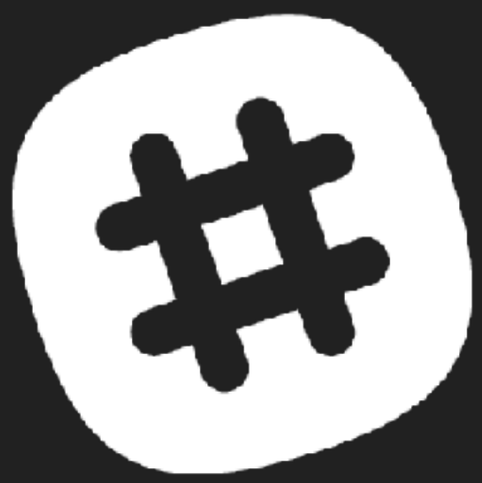
jenna.is/at-qconsf

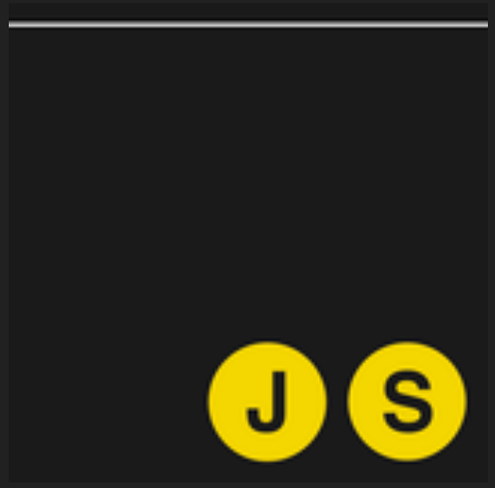
@zeigenvector

Senior Frontend Engineer
at Slack

Organizer of EmpireJS

Organizer of BrooklynJS





Whatchu know 'bout FE?
Whatchu, whatchu know 'bout FE?
Whatchu know 'bout FE?
Whatchu, whatchu know?
♪♪♪

[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)

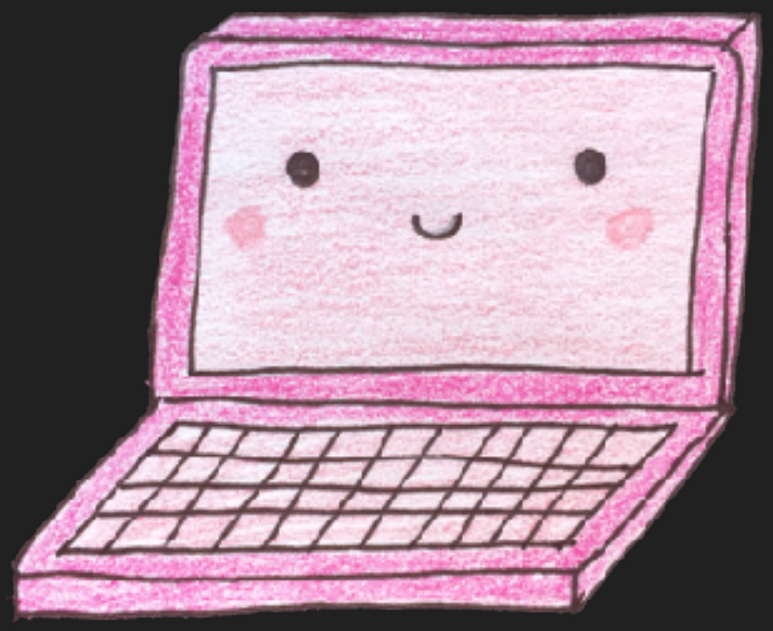
but wait

how do

websites?

how do websites?

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

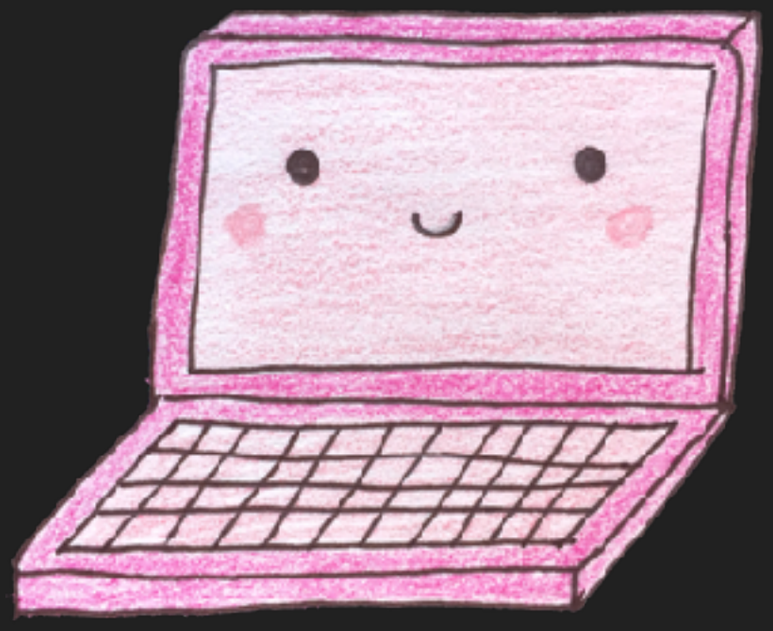


how do websites?

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

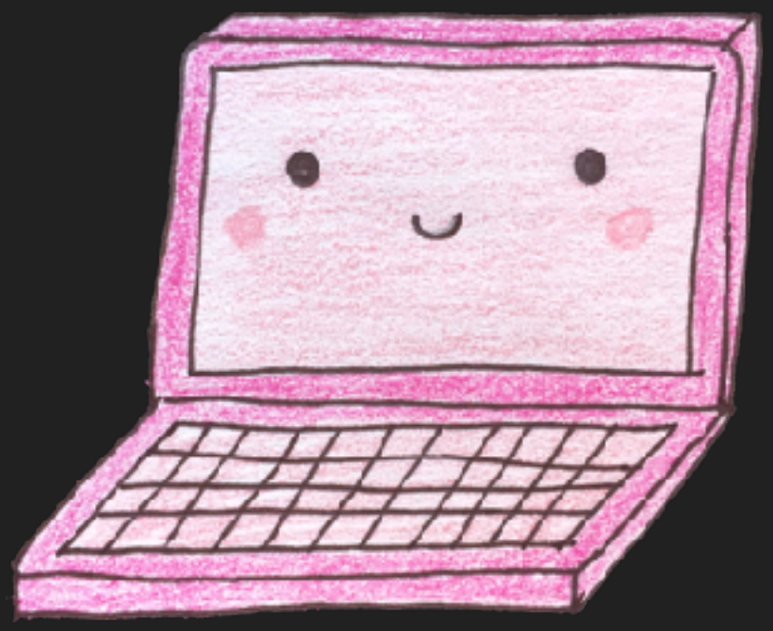
how do websites?

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

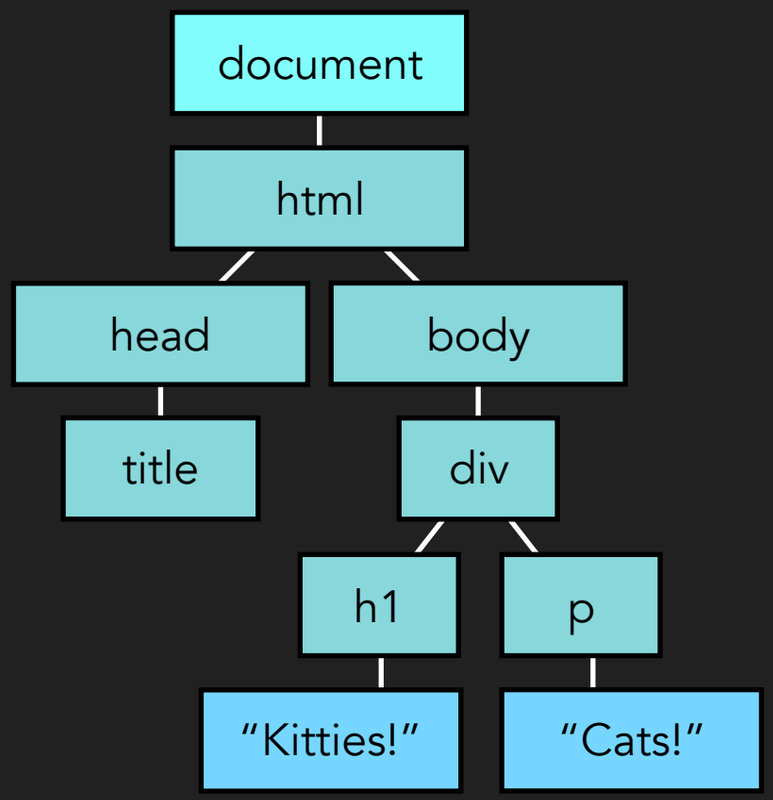


how do websites?

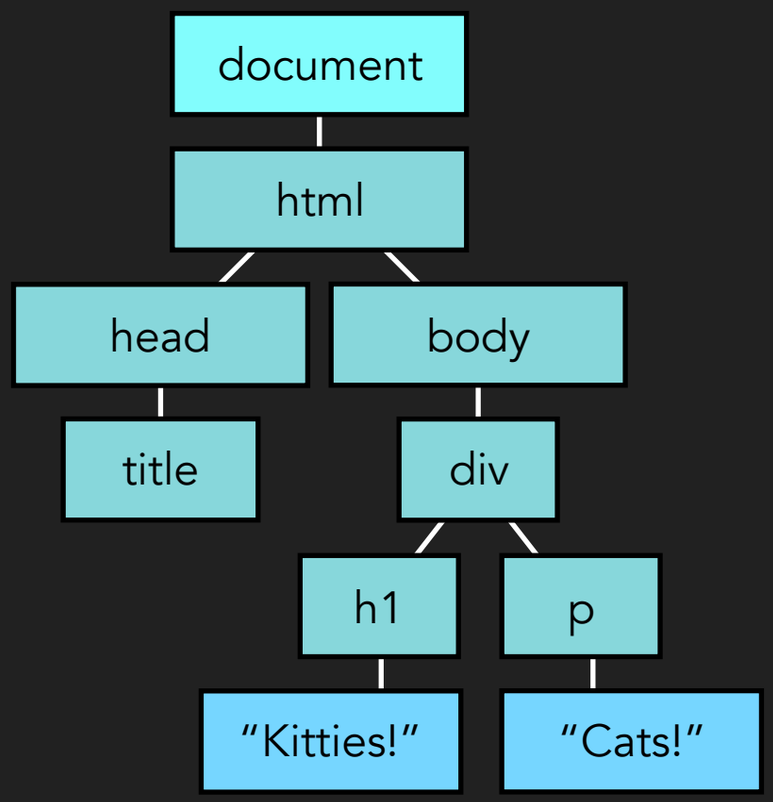
Are you listening?
(Whoa-oh-oh-oh-oh)
Please come back.
(Whoa-oh-oh-oh-oh)
I'll tell you what do I need
I'll tell you what do I need
Whoa-oh, whoa-oh
♪♪♪

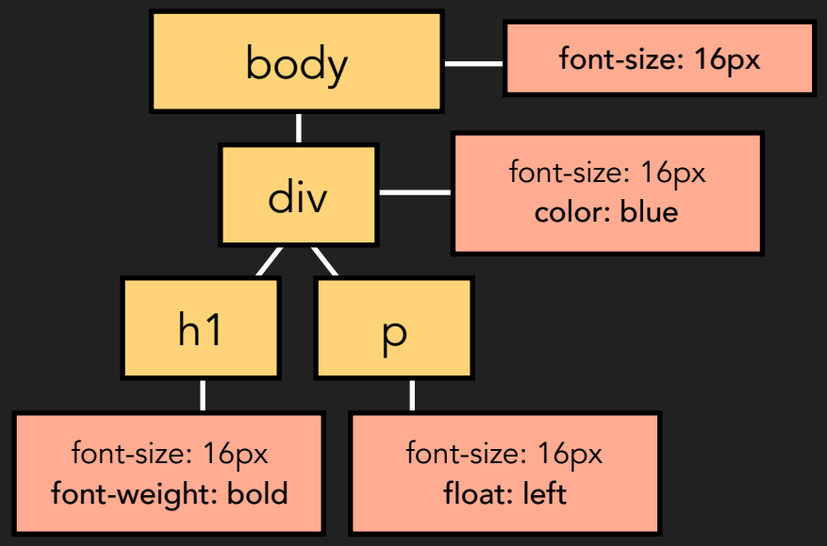


how do websites?

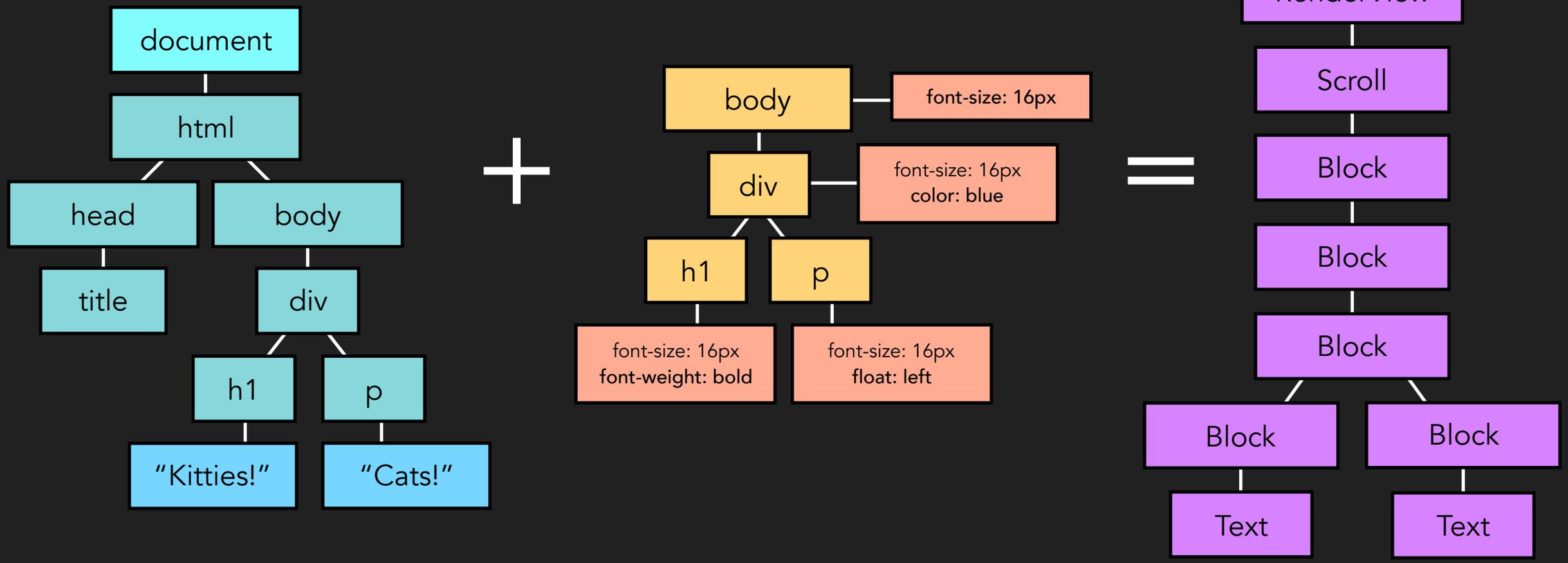


how do websites?

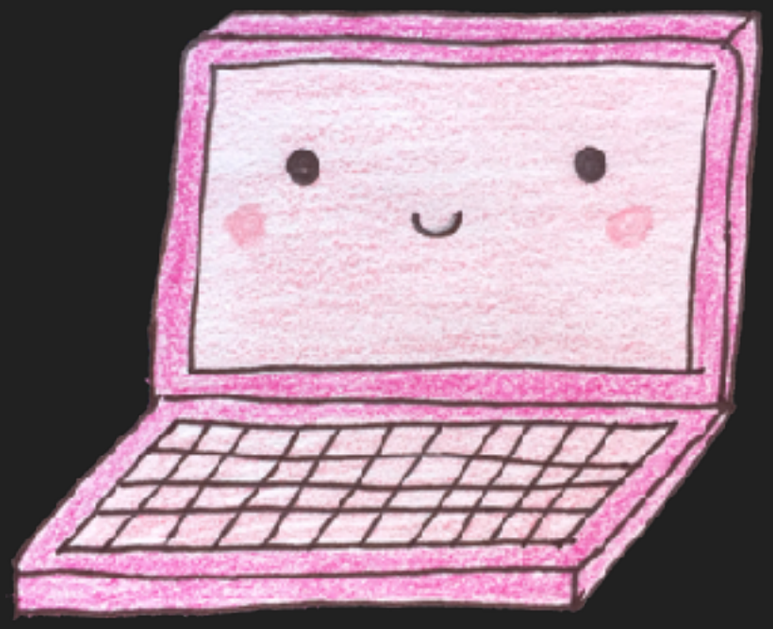




how do websites?



The page was still young
When I first saw you
♪♪♪



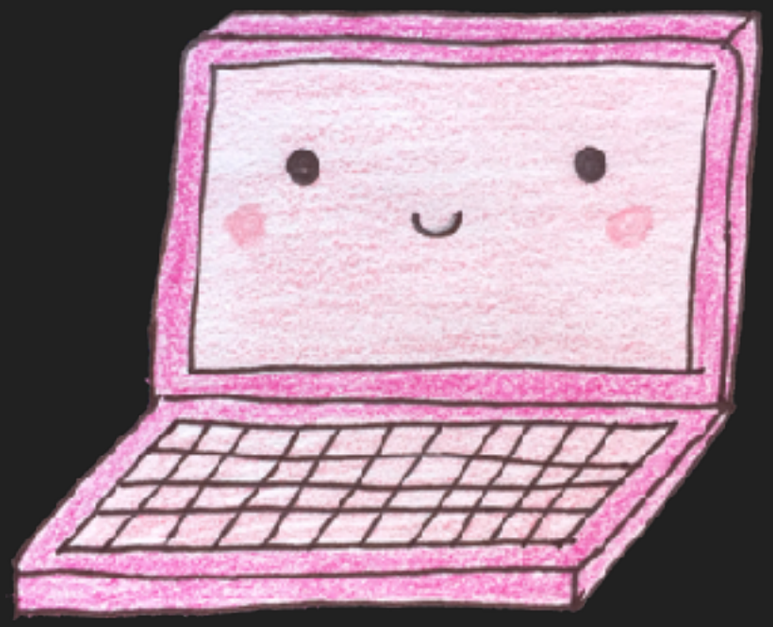
Well, I'm gonna paint my picture
Paint myself in blue and red and green and… a
All of the beautiful pixels
are very, very meaningful
♪♪♪

Whoa, oh, oh, oh, oh
Whoa, oh, oh, oh,
DOM's interactive
DOM's interactive
♪♪♪

keep
things
small

keep things small

Harder, Better,
Faster, Smaller
♪♪♪



keep things small

minify your html, css, and js

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

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

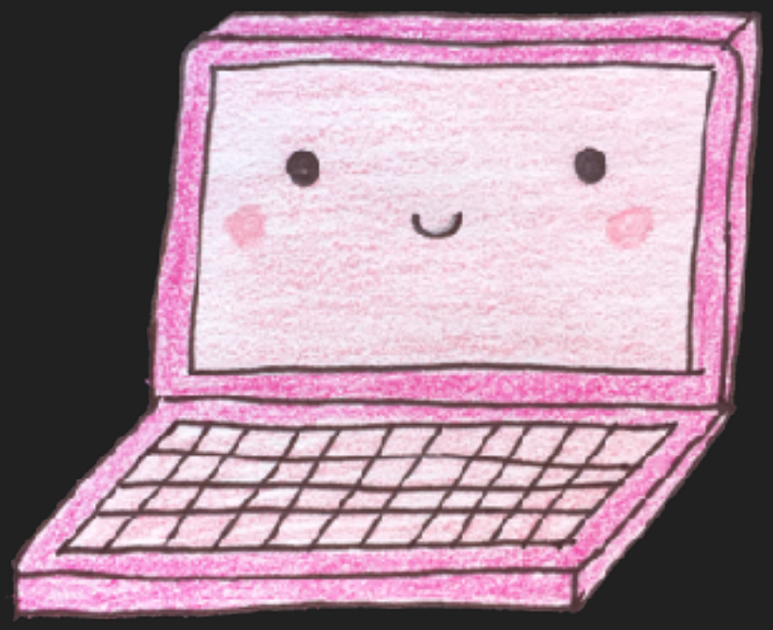
compress your html, css, and js

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

keep things small

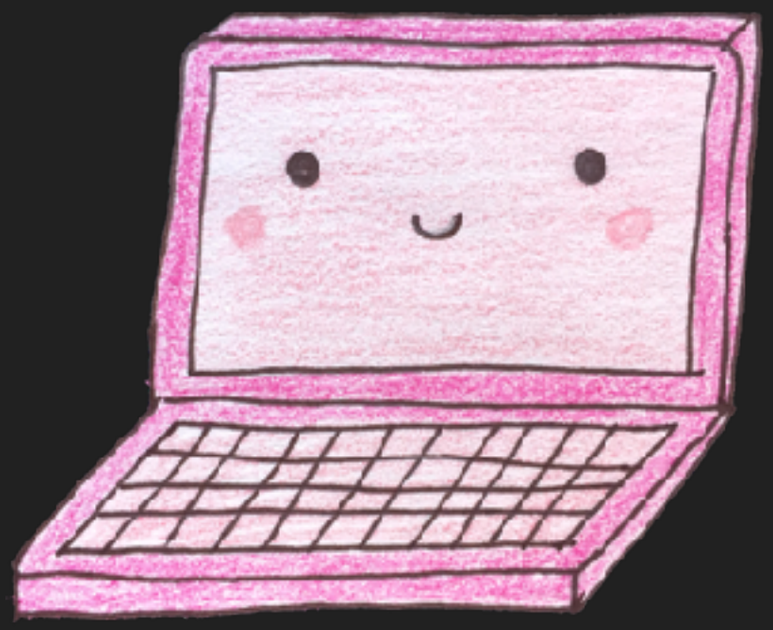
optimize your images

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



keep things small

optimize your images



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

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

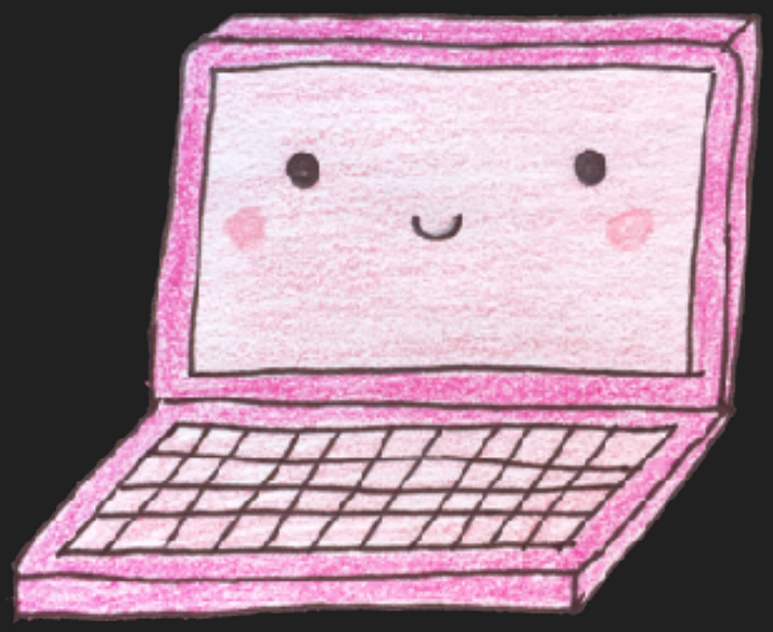
caching

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
♪♪♪

keep things small

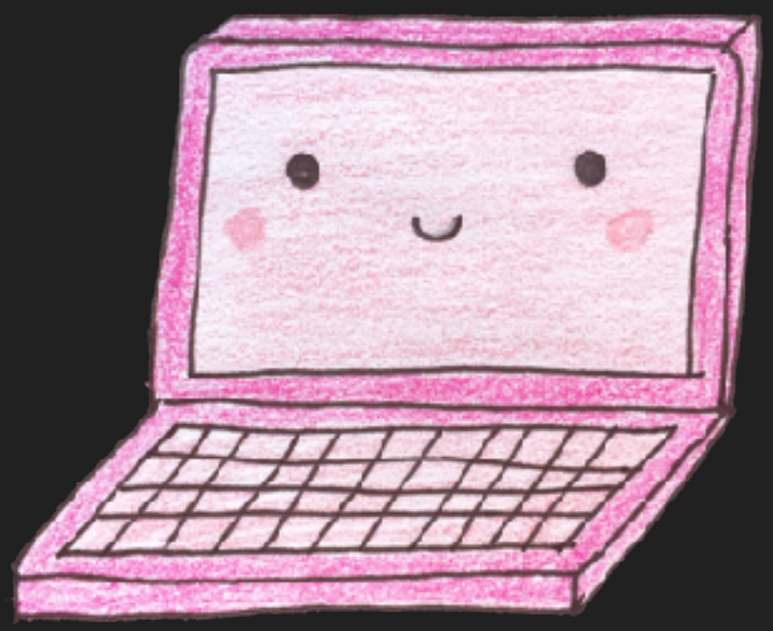
caching

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
♪♪♪



keep things small

only include *necessary* files

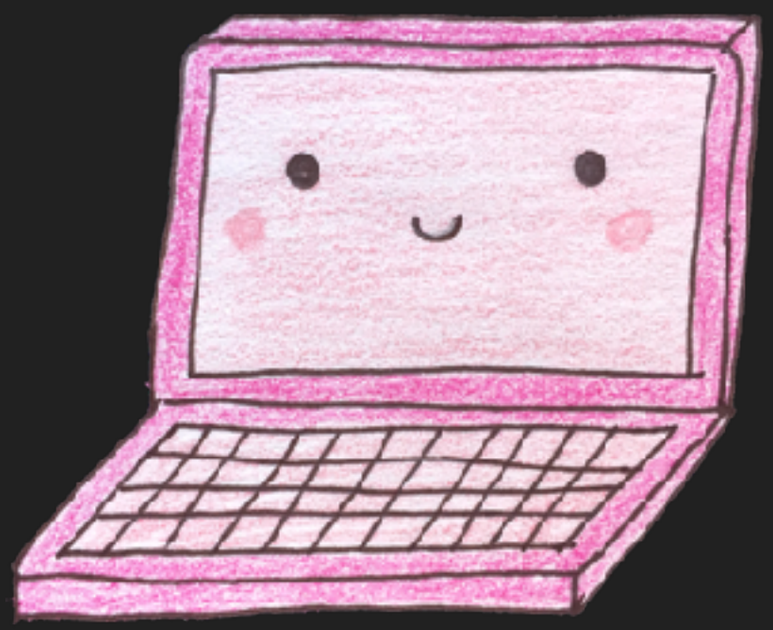


Well I know that
I'll get through this
'Cause I know that I am smart
I don't need you anymore
I don't need you anymore
I don't need you anymore
No I don't need you anymore…
♪♪♪

keep things small

only include *necessary* files

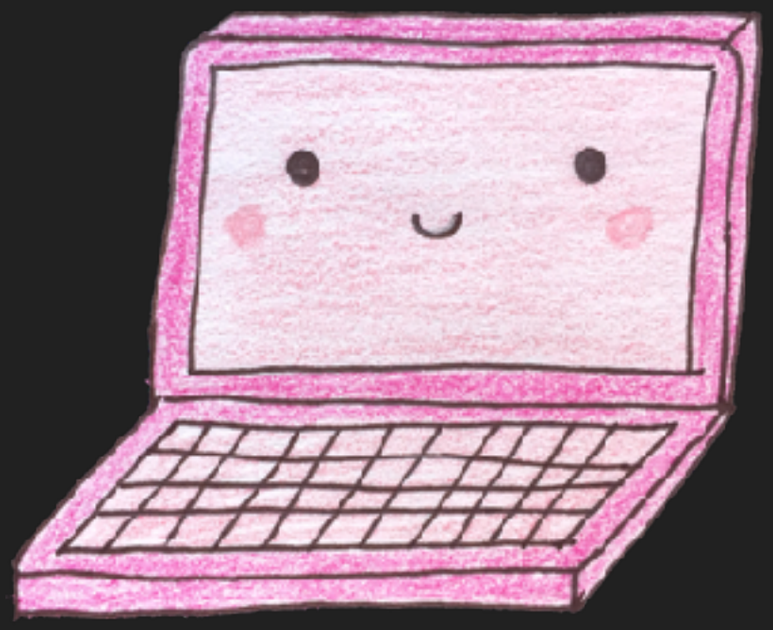
Shake it, shake it, shake it,
Shake it, shake it, shake it,
Shake it, shake it, shake it
Shake it like a JavaScript bundle
Hey ya!
♪♪♪



keep things small

optimize fonts

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



keep things small

put your assets in a cdn

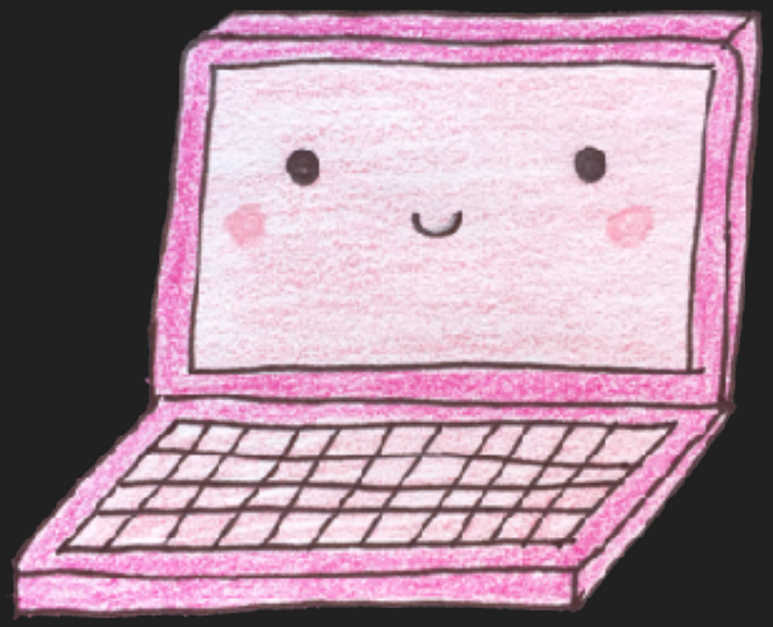
I feel so close to you right now ♪♪♪

keep
things
smart

keep things smart

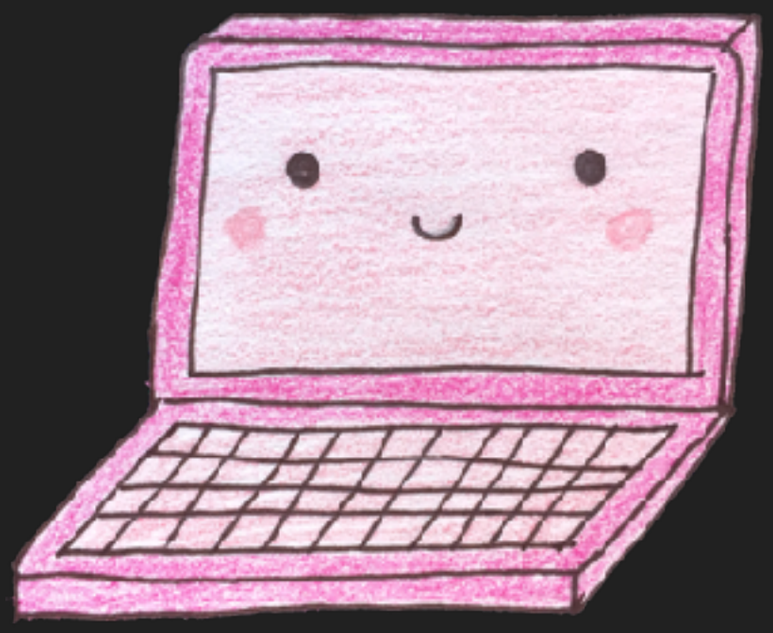
concatenate your css and js

Come together, right now
Up the speed
♪♪♪



keep things smart

use image sprites and icon fonts



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

keep things smart

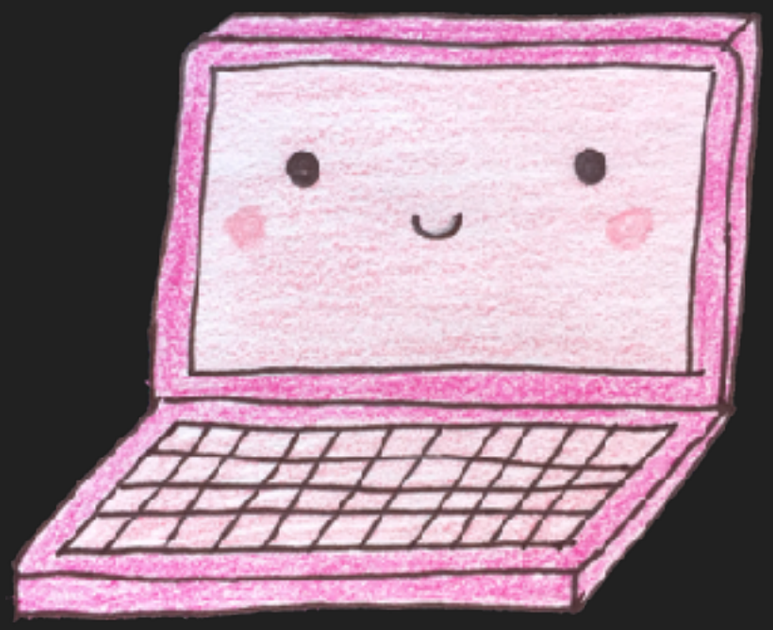
make js non-blocking

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

keep things smart

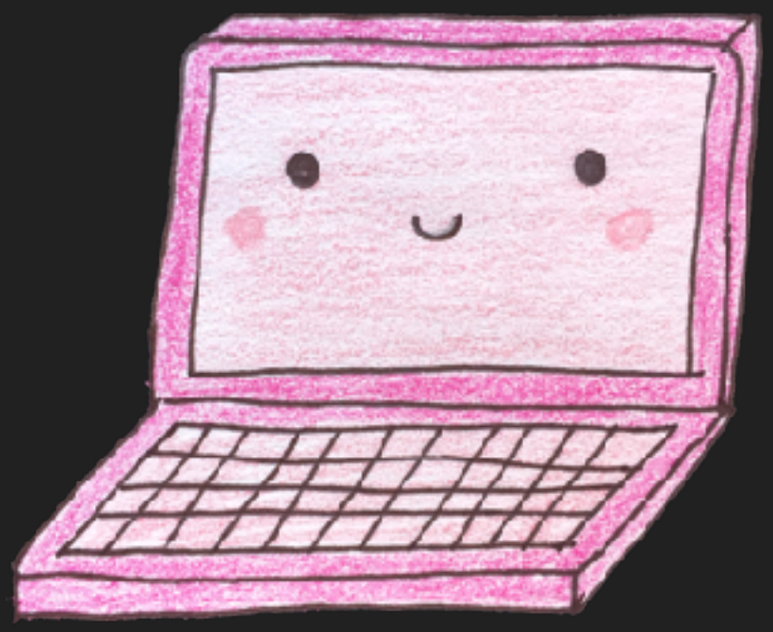
make js non-blocking

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



keep things smart

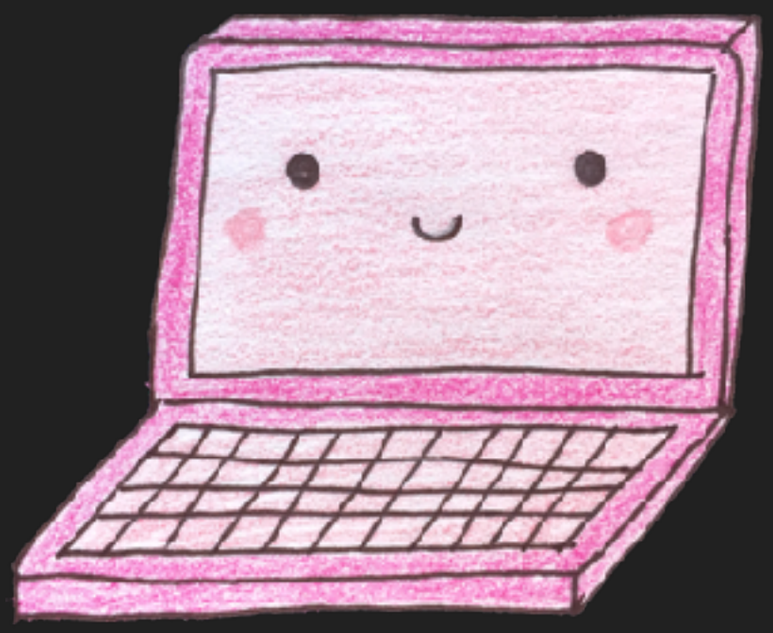
make js non-blocking



We can't stop…
♪♪♪

keep things smart

make js non-blocking

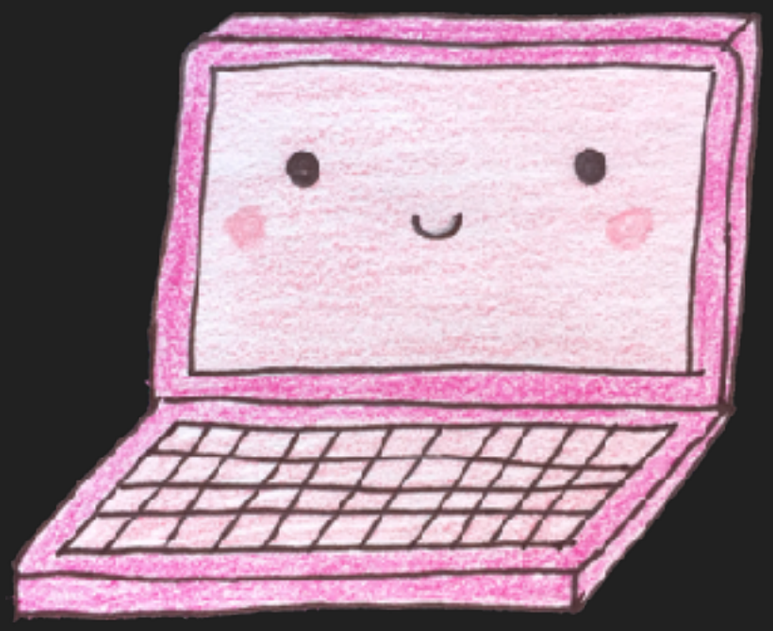


And we won't stop…
♪♪♪

keep things smart

make js non-blocking

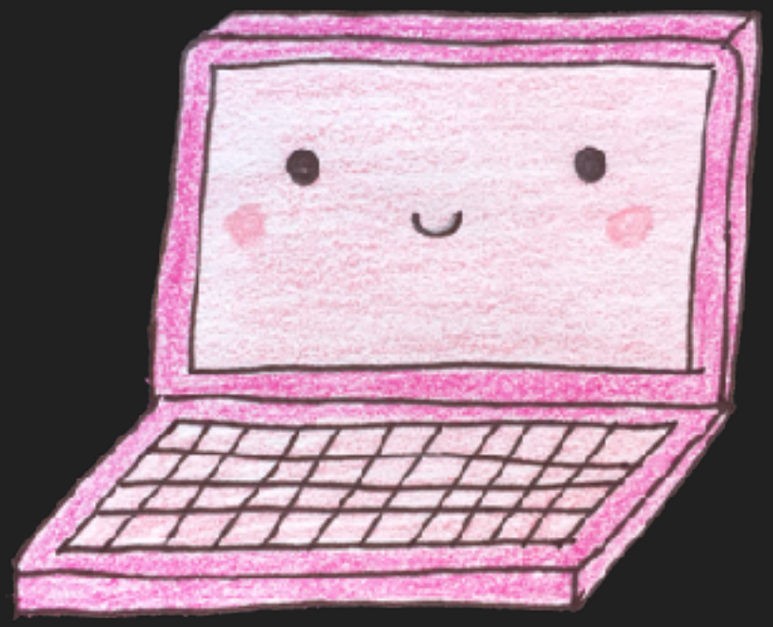
But yeah does it feel so good
'Cause I get scripts when
I want them now
And if you could
then you know you would
'Cause yeah it just feels so
It just feels so good
♪♪♪



keep things smart

put css at the top

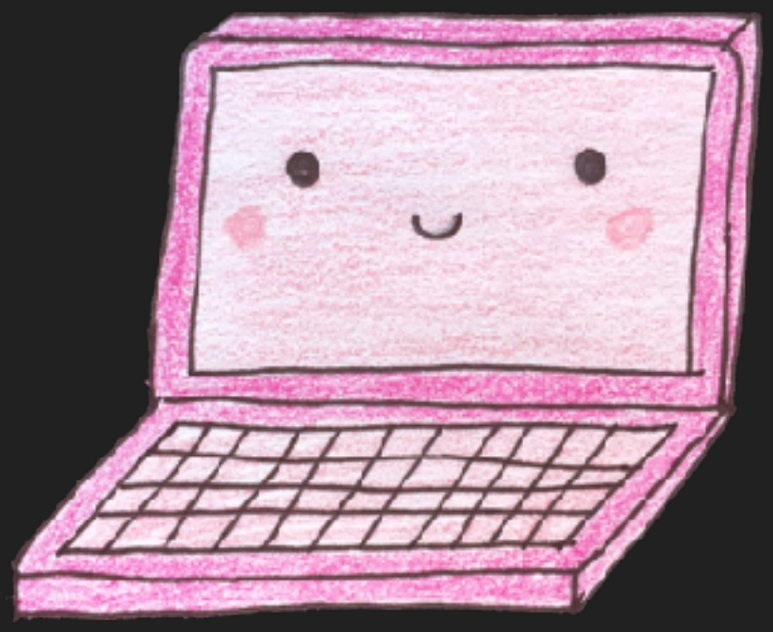
In your <head>
In your <head>
Stylesheet, stylesheet,
eet, eet, eet
♪♪♪



keep things smart

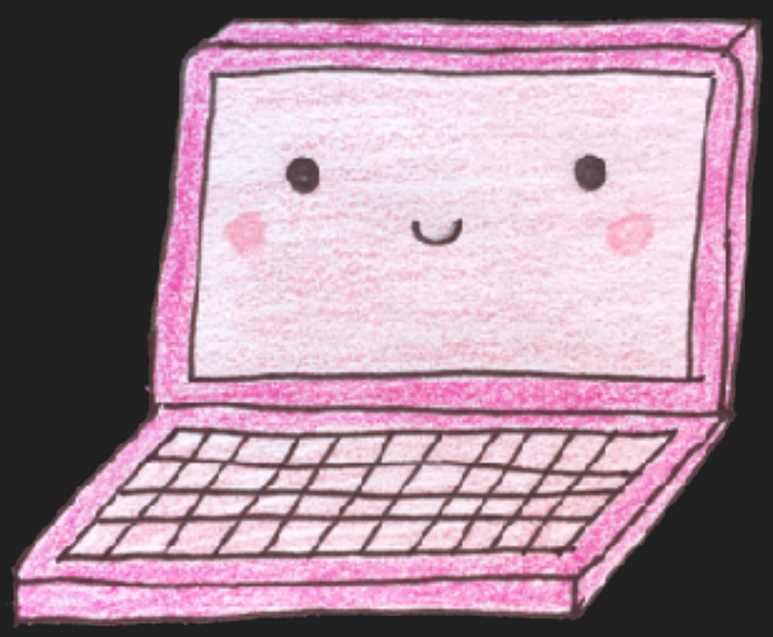
put css at the top

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



keep things smart

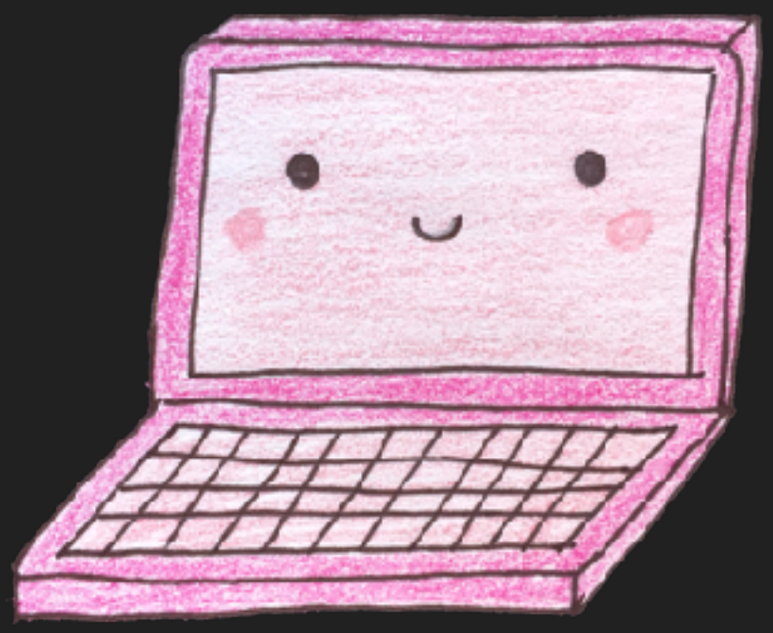
use http/2



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

keep things smart

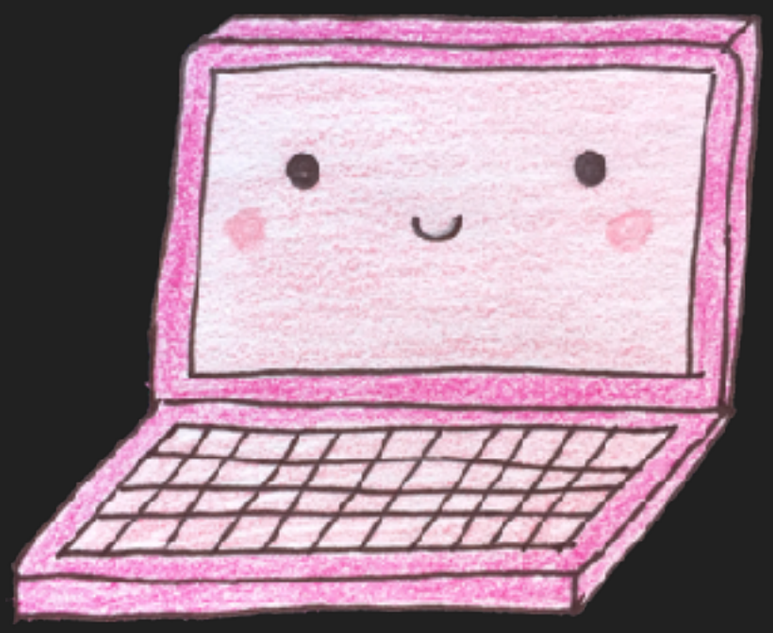
use http/2



Want you to make me feel
Like I'm the only
TCP connection in the world
♪♪♪

keep things smart

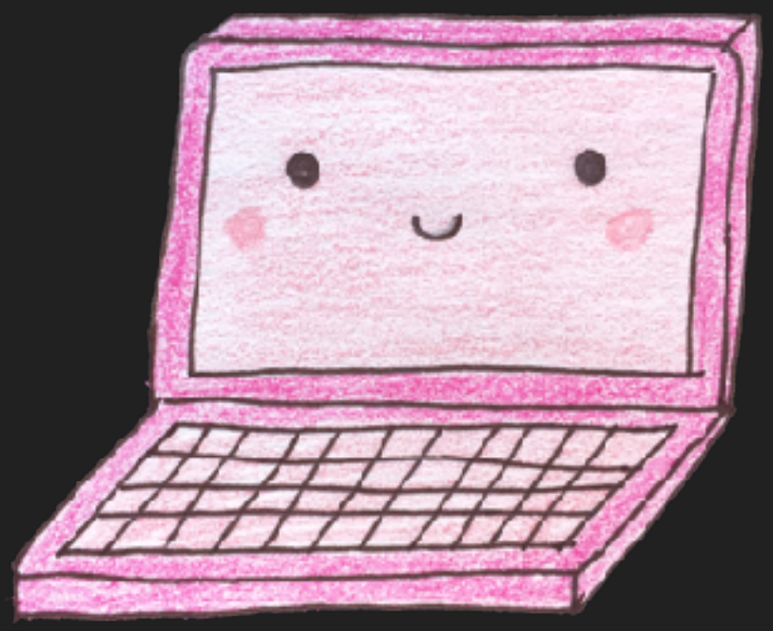
use http/2



These are my compressions
♪♪♪

keep things smart

use http/2



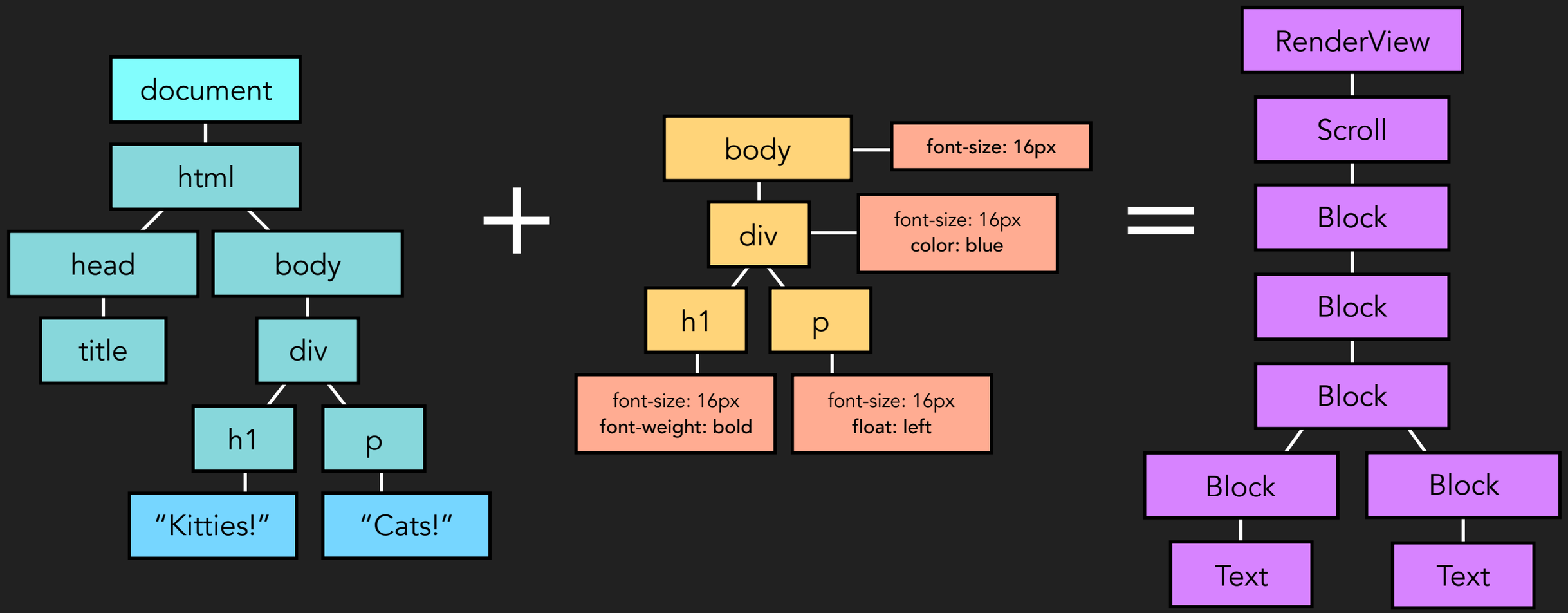
Ah, push it
Push it good
Ah, push it
Push it real good
♪♪♪

keep
things
smooth

keep things smooth

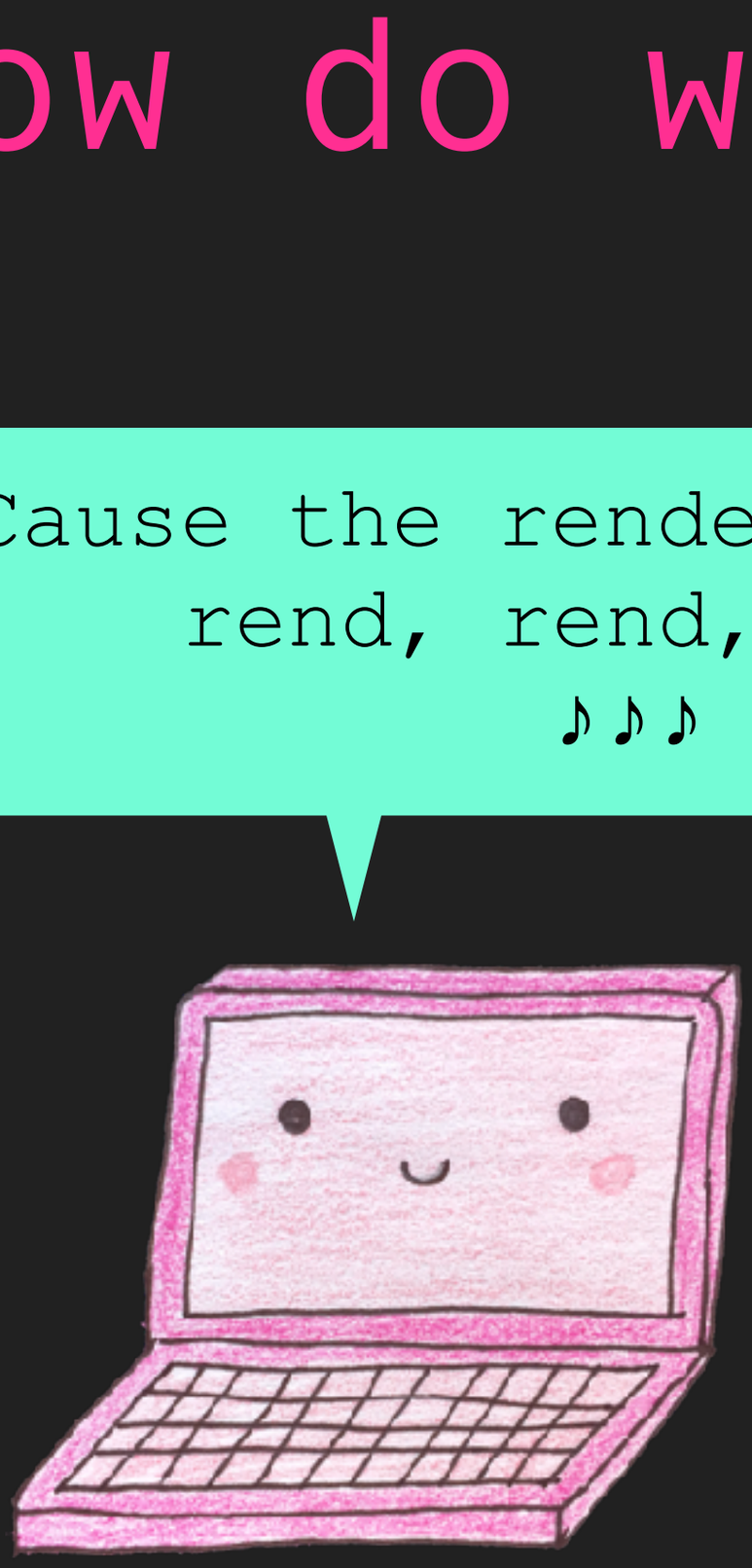
You got the kind of scrollin'
That can be so ~smooth~, yeah
Get rid of jank, make it real
Or else forget about it
♪♪♪

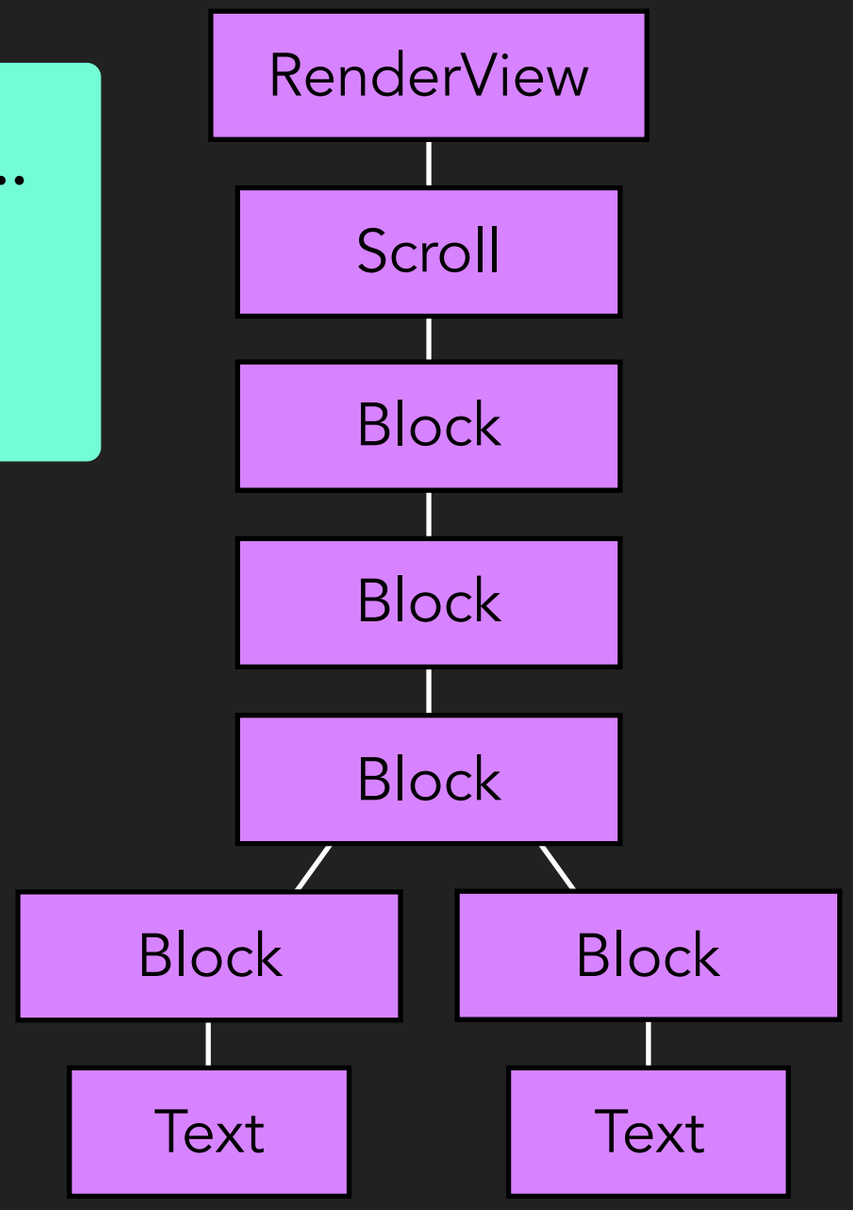
how do websites, pt 2



how do websites, pt 2

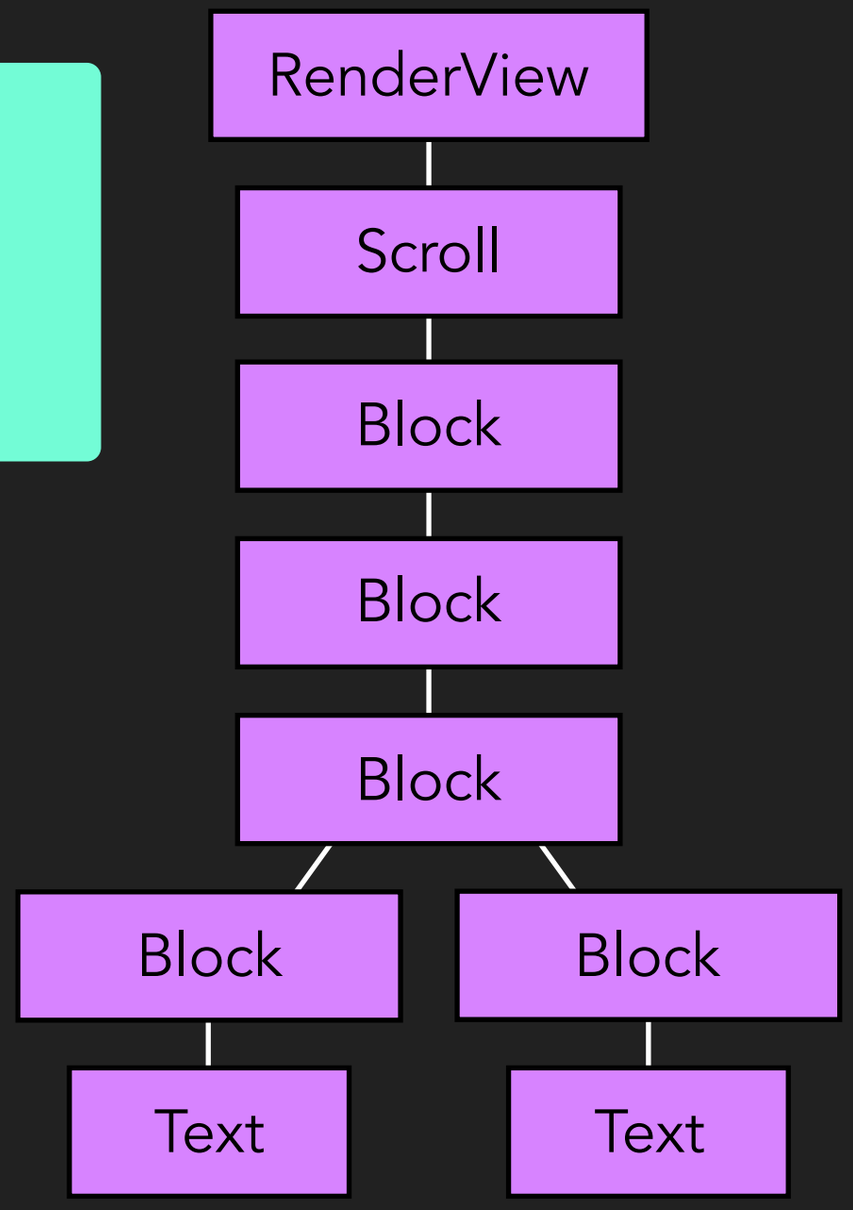
Cause the render's gonna…
rend, rend, rend?
♪♪♪





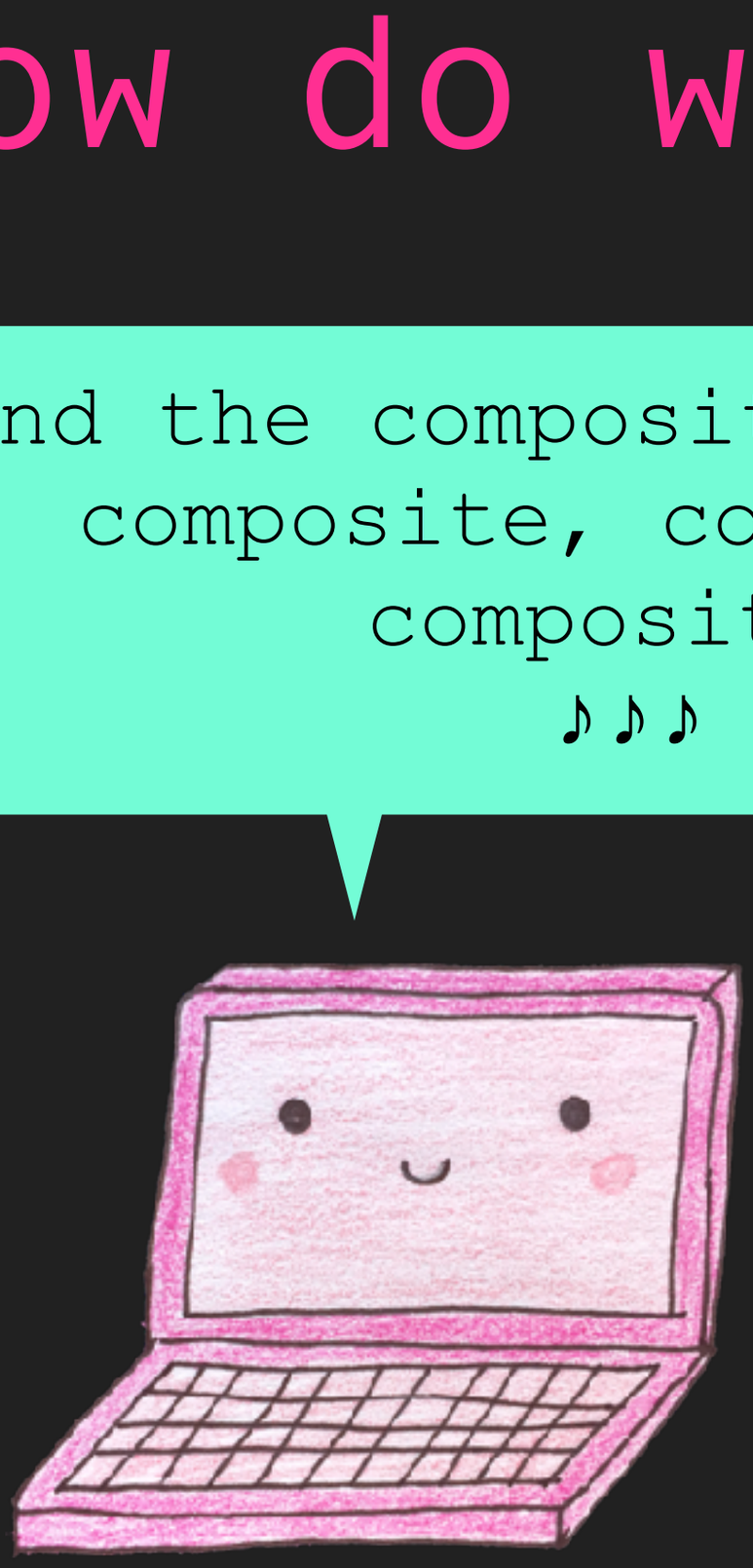
how do websites, pt 2

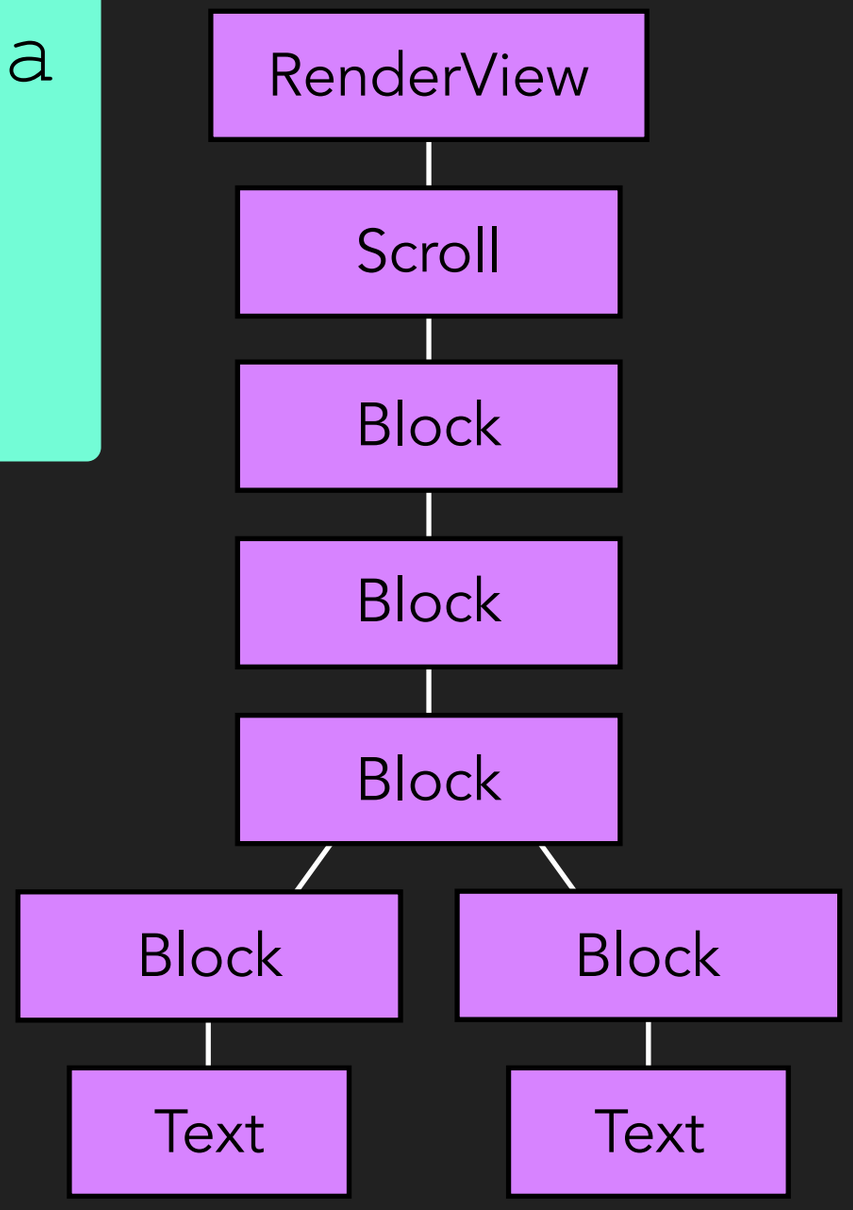
And the painter's gonna paint, paint, paint…
♪♪♪



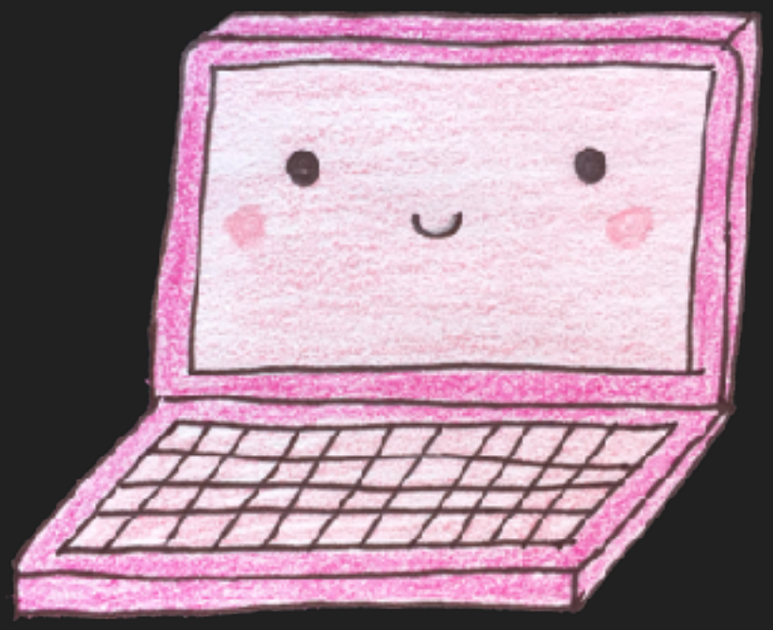
how do websites, pt 2

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



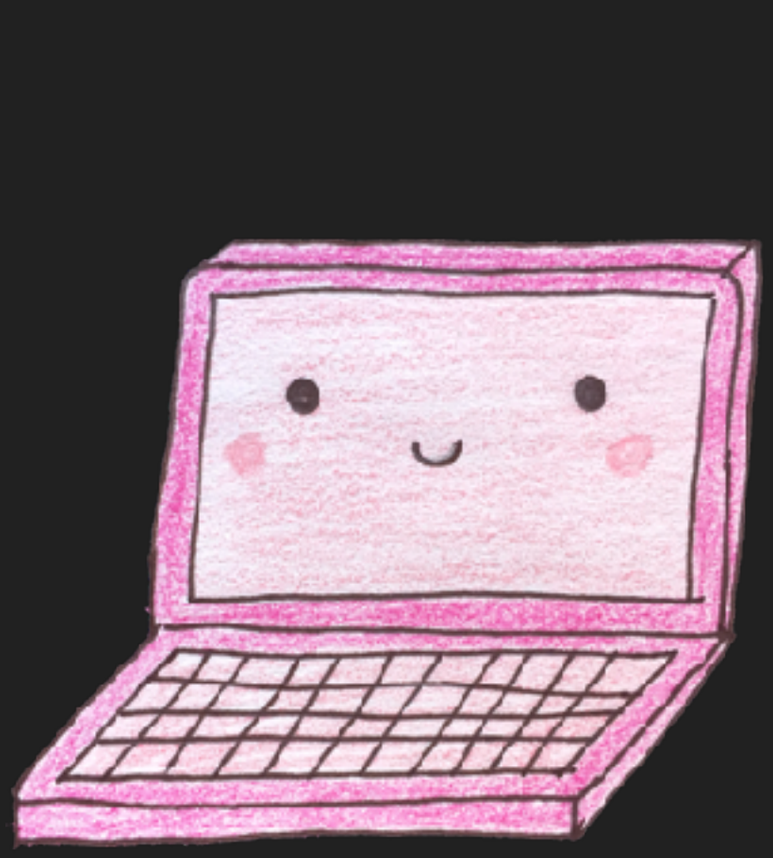


how do websites, pt 2



how do websites, pt 2

Layout → Painting → Compositing

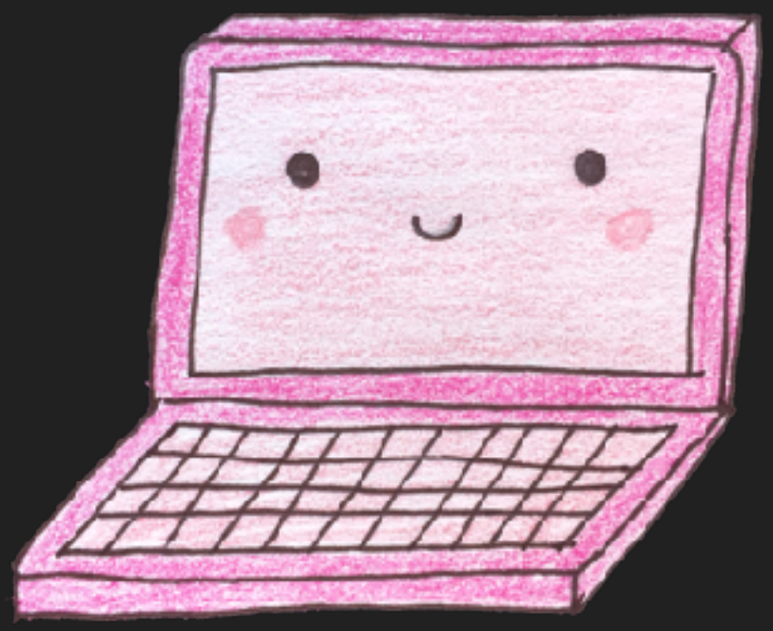


how do websites, pt 2

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
♪♪♪

how do websites, pt 2

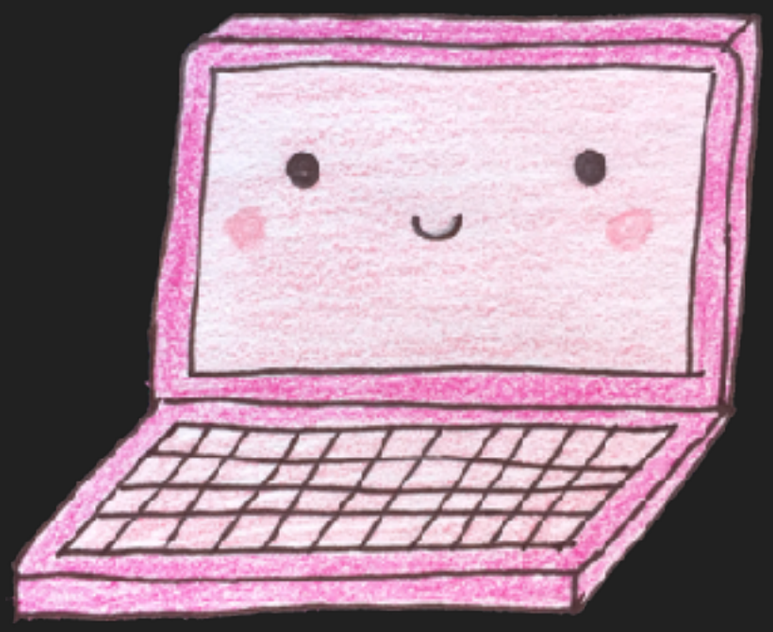
Here’s to never ending circles
And building them on top of me
And here's to another no, man
You won’t get a render
You won’t get a render
♪♪♪



keep things smooth

use requestAnimationFrame

Debounce bounce bounce bounce bounce bounce bounce bounce bounce
♪♪♪



keep things smooth

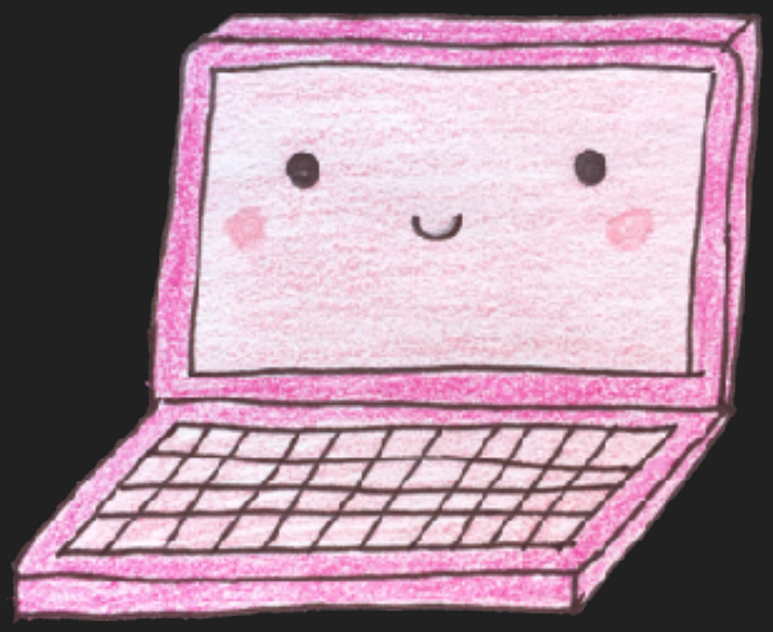
use requestAnimationFrame

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

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
♪♪♪



keep things smooth

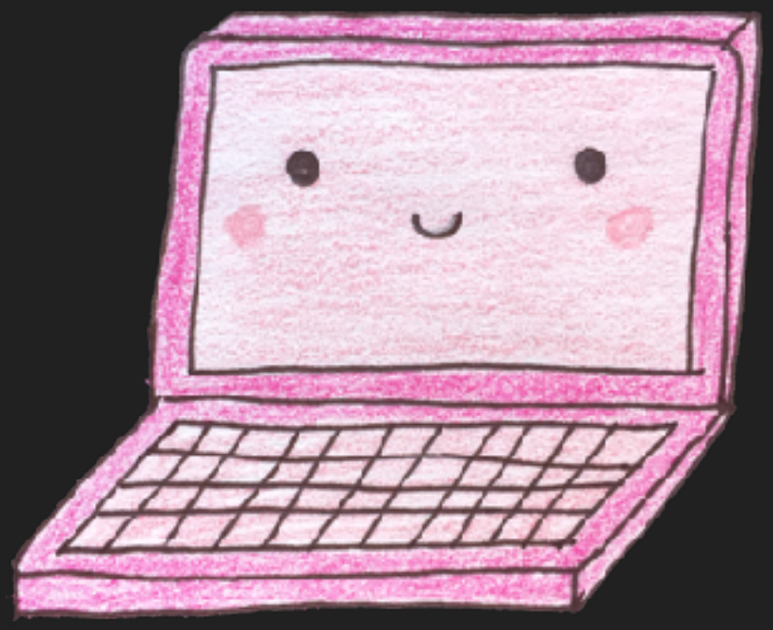
use web workers

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

keep things smooth

use web workers

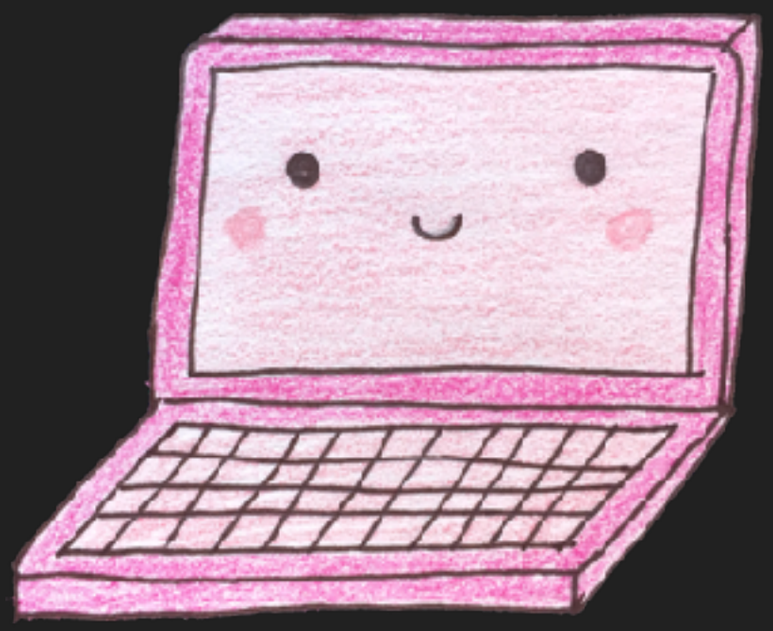
When what you have
Will take too long
Move along, move along
Like I know you do
♪♪♪



keep things smooth

animate with transform + opacity

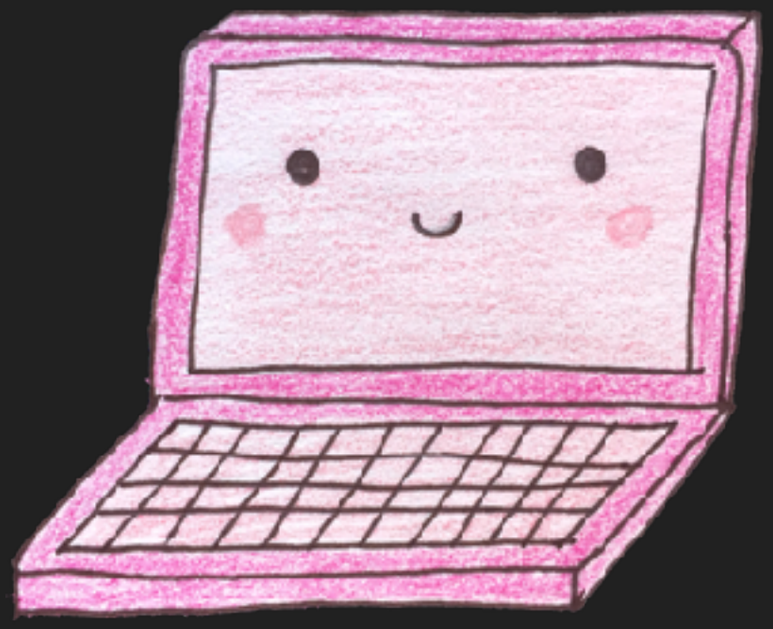
I, I, I, I, I, I
Know how to transform
I transform, I transform
I'm a transformer
I, I, I, I, I, I
Know how to transform
I transform (I can do it!)
I'll transform (I can do it!)
I'm a transformer
♪♪♪



keep things smooth

animate with transform + opacity

Layout → Painting → Compositing



keep things smooth

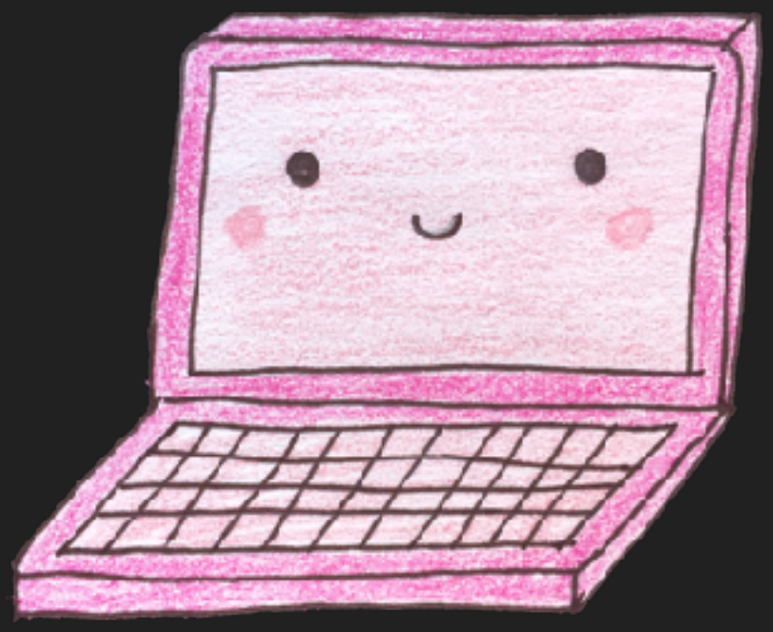
animate with transform + opacity

```
.moving-element {
    will-change: transform;
}
```

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 on me
Or BEM it on you.
♪♪♪



keep things smooth

use a css methodology

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

https://developers.google.com/web/fundamentals/performance/rendering/reduce-the-scope-and-complexity-of-style-calculations

keep things smooth

use a css methodology

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

https://developers.google.com/web/fundamentals/performance/rendering/reduce-the-scope-and-complexity-of-style-calculations

always
measure
first

always measure first

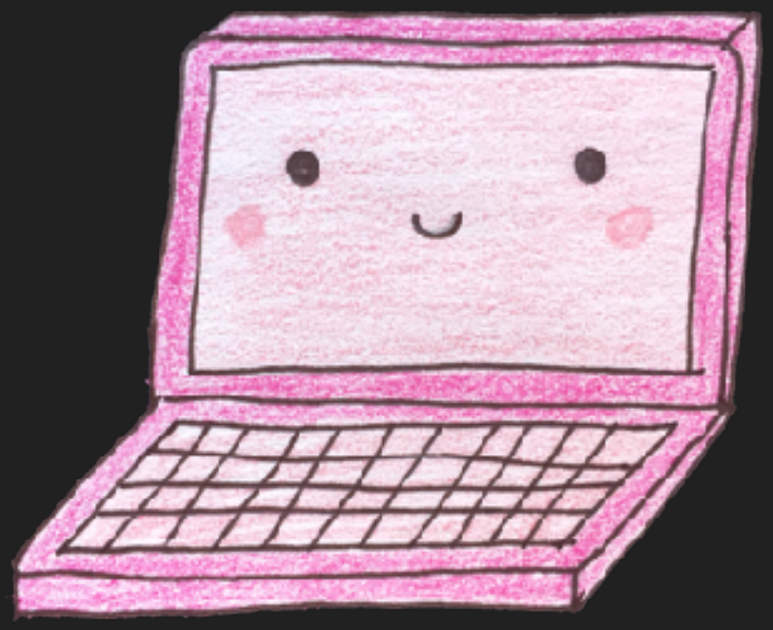
synthetic measurements

Is someone getting the test,
the test, the test,
the test 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
♪♪♪



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
- High Performance Browser Networking
- Server Farm to Table, Annotated

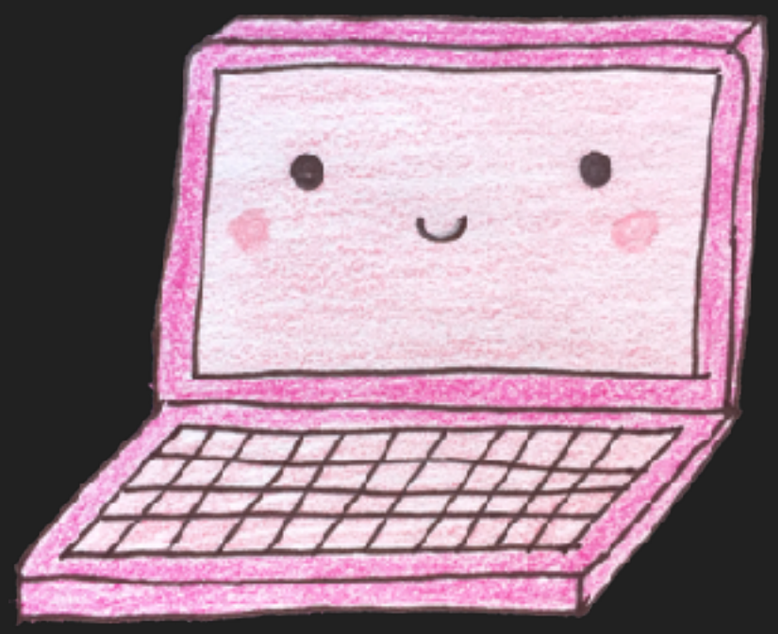
Complete Tracklist

Lil' Mama - Lip Gloss
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
Taylor Swift - Love Story
Counting Crows - Mr. Jones
Imagine Dragons - Radioactive
Daft Punk – Harder, Better, Faster, Stronger
Taylor Swift - Blank Space
Missy Elliot - Work It
Blink 182 - All The Small Things
Bright Eyes - The Big Picture
Gotye - Somebody That I Used To Know
Pitbull ft. Ke$ha - Timber
Cher - Believe
OutKast - Hey Ya
Sia - Cheap Thrills
Calvin Harris - Feel So Close
The Beatles - Come Together
Jack Johnson - Better Together
Drake - Started from the Bottom

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
Beyoncé - Upgrade U
Rihanna - Only Girl in the World
Usher - Confessions Part II
Salt-N-Pepa - Push It
Santana ft. Rob Thomas - Smooth
Taylor Swift - Shake it Off
Katy Perry - Last Friday Night (T.G.I.F)
Salt-N-Pepa - Shoop
CHVRCHES - Never Ending Circles
R. Kelly - Ignition
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

something witty about a POP server…



Thanks!

jenna.is/at-qconsf

@zeigenvector