LET'S ⚡ TALK ABOUT CSS TRIGGERS

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HOW BROWSERS RENDER STUFF (GENERALLY)

- Different browsers use different rendering engines but follow similar flow
- Browser will parse the markup, then "Recalculate Style" to figure out what styles apply to which elements
- Next, it will "Layout" all the DOM elements
- Then, "Paint" the pixel data for the elements
- And, "Composite" will combine and draw the painted layers out onto the screen
THINK OF IT AS A PYRAMID

If you change something at the bottom, the pyramid has to be rebuilt from the bottom.
LAYOUT

- Generate geometry and position of each element
- Very expensive because engine must reflow the relevant element and all its children to take into account the new layout
- Occurs when the DOM tree is manipulated, or a style which affects layout is changed, when browser window size is changed, when className property is changed
CSS PROPERTIES THAT TRIGGER LAYOUT

- width
- height
- padding
- margin
- display
- border-width
- border
- top
- position
- font-size
- float
- text-align
- overflow-y
- font-weight
- overflow
- left
- font-family
- line-height
- vertical-align
- right
- clear
- white-space
- bottom
- min-height
PAINT

- Fill out pixels for each element into layers
- Make something visible when it previously was not, like adding outline or changing background colour
- Expensive because the engine searches through all elements to determine what is visible and what should be displayed
- Browser vendors are scrambling to improve the renderer, but until recently browsers weren't built to handle animations efficiently
CSS PROPERTIES THAT TRIGGER PAINT

- color
- border-style
- visibility
- background
- text-decoratation
- background-image
- background-position
- background-repeat
- outline-color
- outline
- outline-style
- border-radius
- outline-width
- box-shadow
- background-size
Only Opacity and Transforms trigger composite
Blink and Webkit creates new layer for elements with CSS transforms or opacity
translateZ(0) is used to force layer creation which ensures both the layer is painted as soon as the animation starts
Watch The Web's Black Magic for best explanation on rendering and compositing
TO FIND OUT MORE...

- Jank Free (website)
- CSS Triggers by Paul Lewis (website)
- High Performance Animations by Paul Lewis and Paul Irish
- Hardware Accelerated CSS: The Nice vs The Naughty by Ariya Hidayat
- Animations and performance by Paul Irish and Sam Thorogood
- The Web's Black Magic by Matthew Delaney and Jing Jin (conference talk)
- Animating the Web with Rachel Nabors (podcast)
THE END

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