



Introduction: How a webpage is loaded and displayed?

- Xiaoxing Ye
- Sun Never Sets Studio

Webpage

- ▶ What is a webpage?

Webpage

- ▶ This is a webpage. The homepage of Google.



Google Search

I'm Feeling Lucky

Google.com.hk offered in: [中文（繁體）](#) [中文\(简体\)](#)

YAHOO!



Mail

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Finance

Sports

Politics

Celebrity

TV

Style

More...

Webpage

- ▶ This is also a webpage. The homepage of Yahoo.



GOP uses 'nuclear option' over SCOTUS pick

A long-standing precedent requires the Senate to end filibusters of Supreme Court nominees. But the GOP is removed in order to push through its nominee.

Rules are changed »



5843 people re



Nunes steps down from House Russia probe



Bikini selfie saves 21-year-old's life



Schumer's swimsuit sparks angry debate



Murder suspect posts unprecedented \$35M bail



Controversy reduces



News Associated Press

Girl found living with monkeys in Indian forest

Indian police are reviewing reports of missing children to try to identify a girl who was found living in a forest with a group of monkeys. The girl, believed to be 10 to 12 years old.



Eight-year-old girl found living with monkeys in Indian forest

International Business Times



Meet the 8-year-old girl living with monkeys

New York Post

Webpage

- ▶ A document which can be displayed in a web browser such as Firefox, Google Chrome, Microsoft Internet Explorer or Edge, or Apple's Safari.
- ▶ A single page, including the images, videos and eta.

What are the steps of a webpage being displayed?

- ▶ A **request** is made when a link is clicked.
- ▶ The page and its resources (files) are downloaded.
- ▶ The web browser uses the page resources to build the page.
- ▶ The page then is rendered (displayed) to the user.

Each of the above steps have many components and details, but those four steps are the main things that happen to display a webpage to a user.

Technically, they are referred as...

- ▶ Request, Response, Build and Render

Link is clicked



Page is refreshed

Navigation bar is used

<https://varvy.com/performance/>



Request

Link is clicked

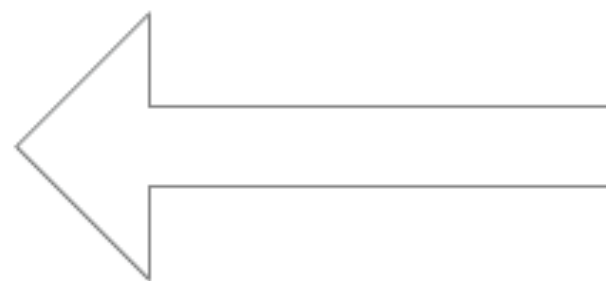


File is requested

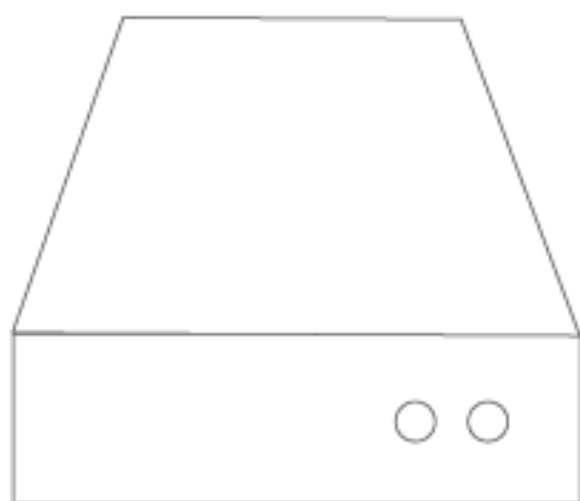




I want this file



OK. Here it is

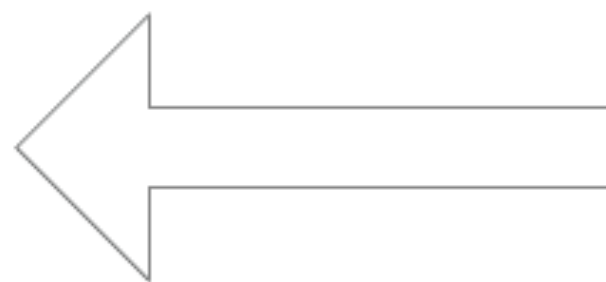
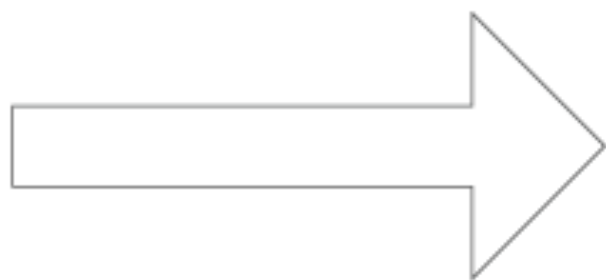


Example Request

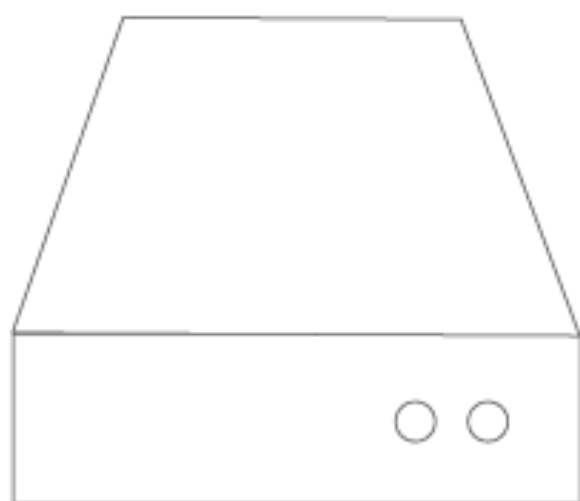
- ▶ GET /http.html HTTP/1.1
User-Agent: user-agent: Mozilla/5.0 Chrome/44.0
Host: varvy.com
Accept-Language: en-us
Accept-Encoding: gzip, deflate
Connection: Keep-Alive



I want this file



OK. Here it is



Response

► HTTP/2 200

accept-ranges: bytes

cache-control: max-age=300, must-revalidate

connection: keep-alive

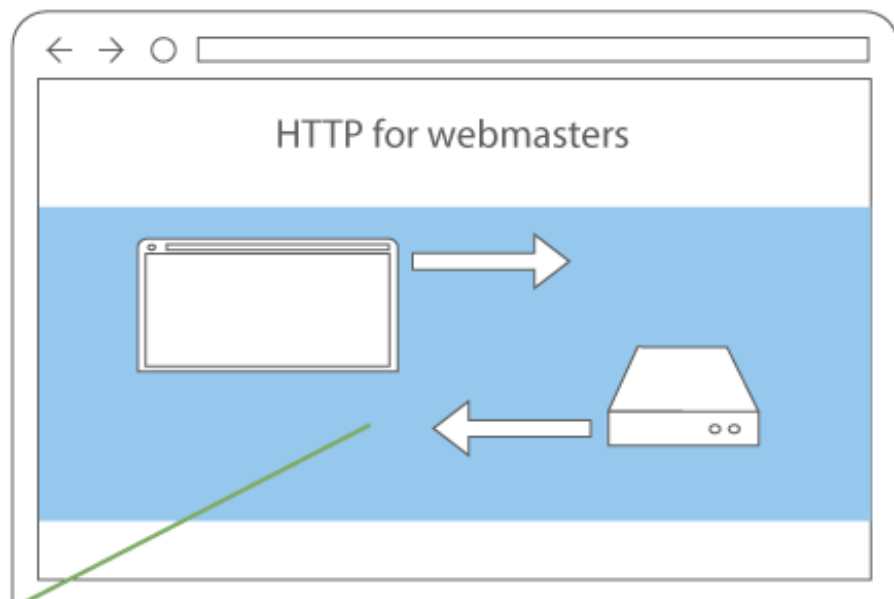
content-encoding: gzip

content-length: 12960

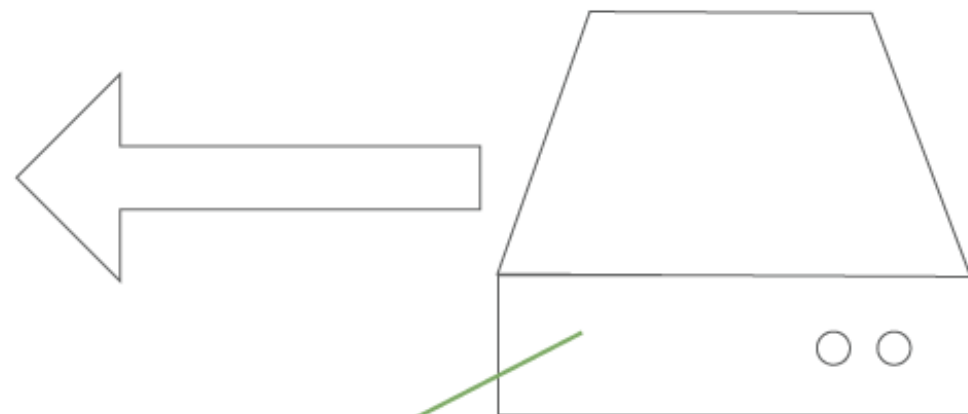
content-type: text/html; charset=utf-8

date: Sun, 02 Aug 2015 12:15:24 GMT

Browser

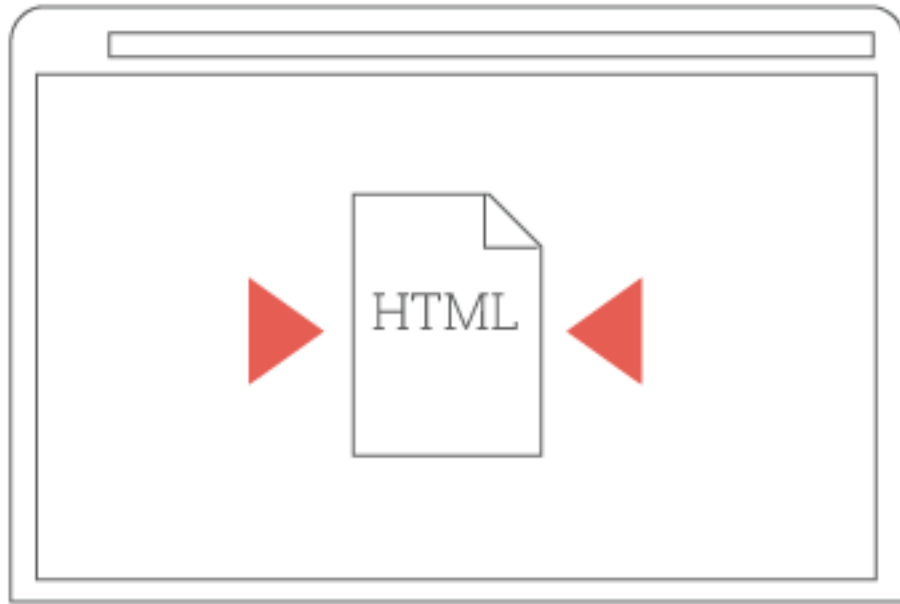


Web page

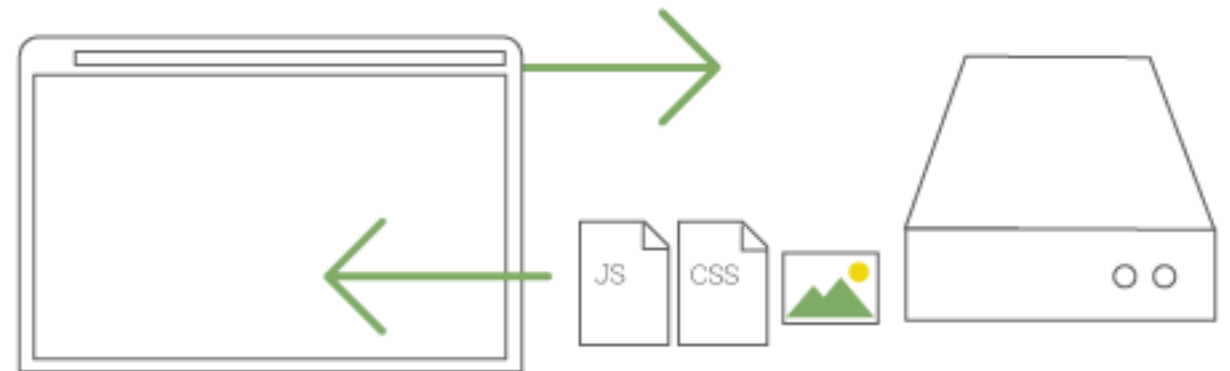


Server

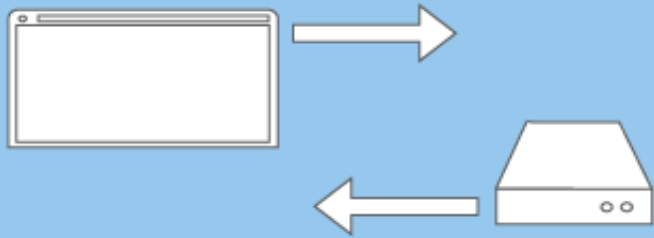
3. web browser reads
html file to find resources



4. web browser requests
found resources from
server



HTTP for webmasters



css file



html file

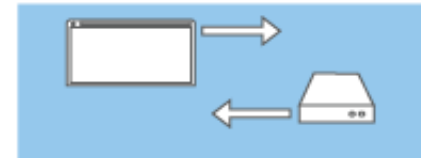
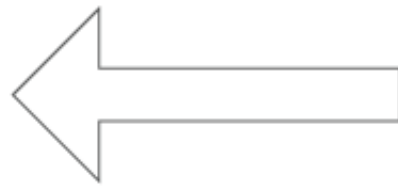


image file



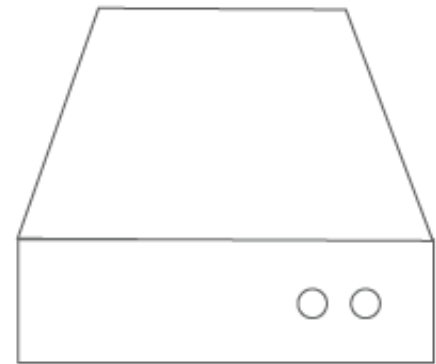
css file



html file



image file



Build

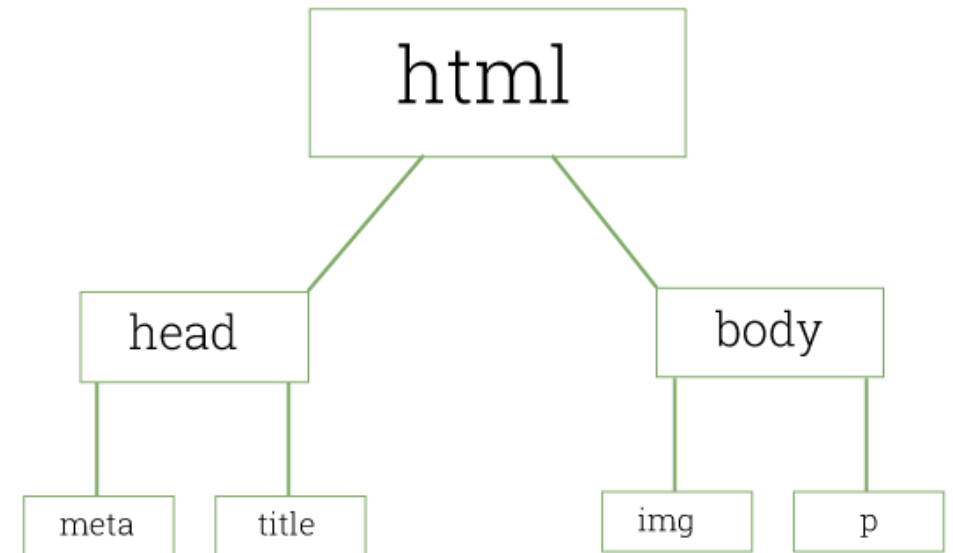
- ▶ Once the web browser has the required resources it can start building the page.
- ▶
- ▶ The way a web browser builds the page is by combining the information found in the document (the original HTML file) and the information found in the resources.

Build

- ▶ There are basically three steps that the browser takes to build a page.
- ▶
- ▶ Build the DOM
- ▶ Build the CSSOM
- ▶ Build the Render Tree

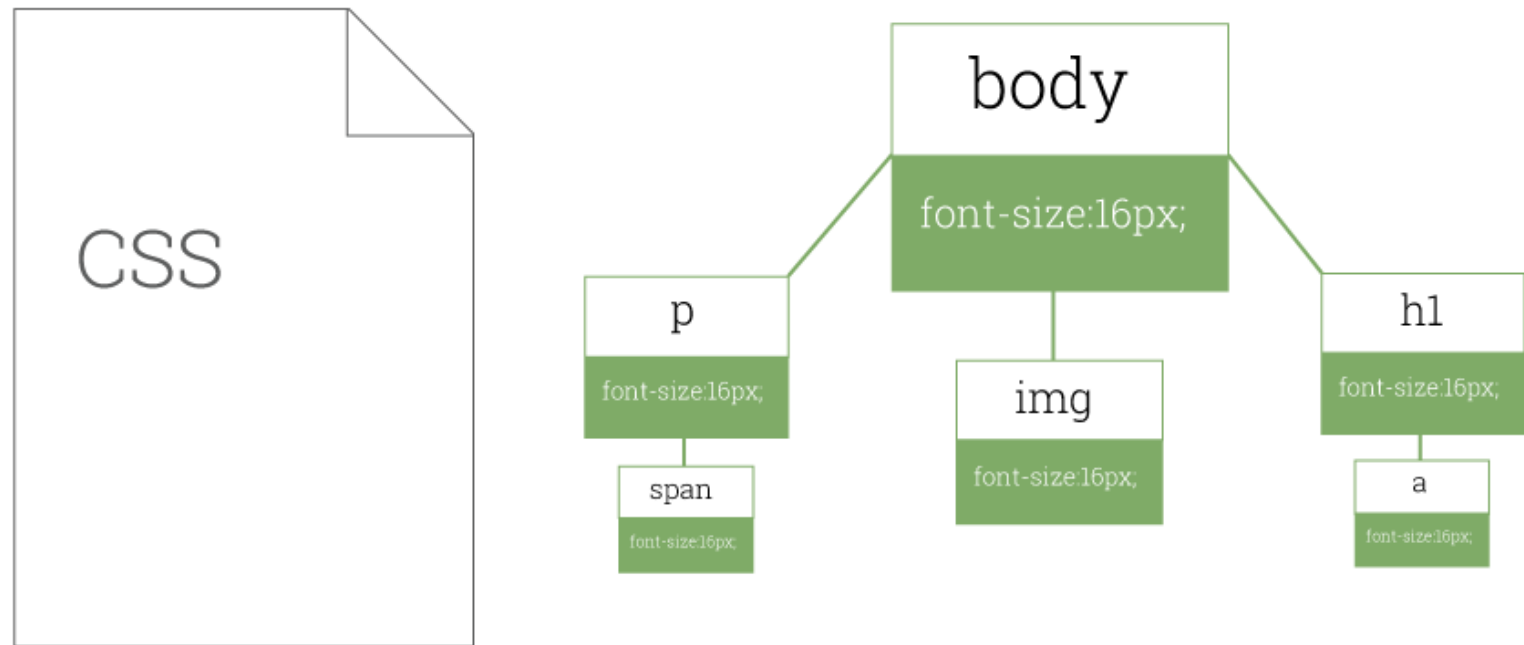
Building the DOM

- ▶ DOM stands for "Document Object Map". It is basically a map of where things are displayed on a page according to the HTML. The DOM represents what the HTML is saying by mapping out the page in a relational manner.

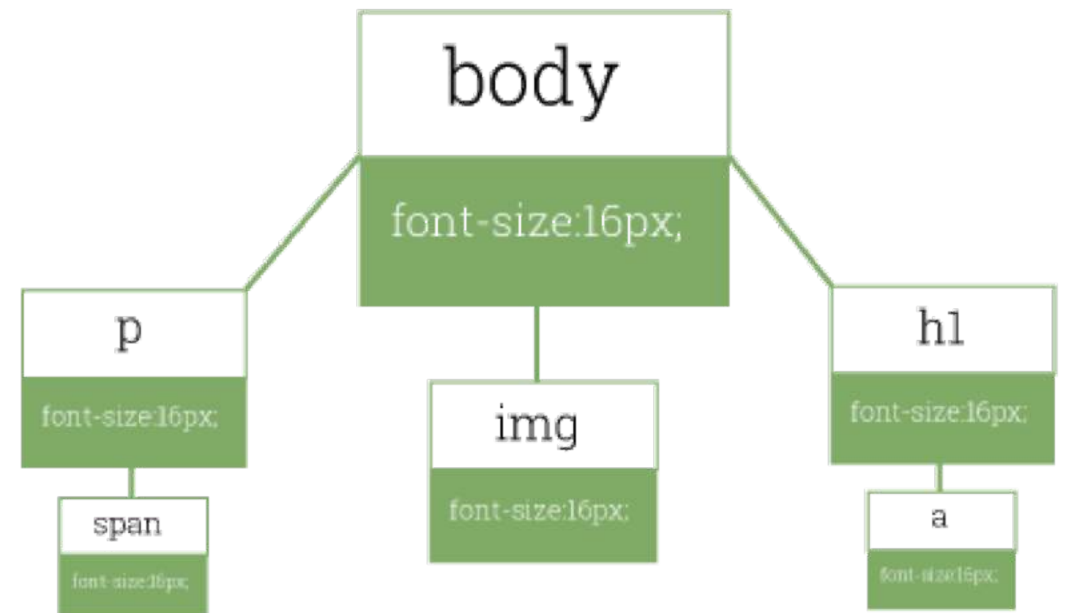
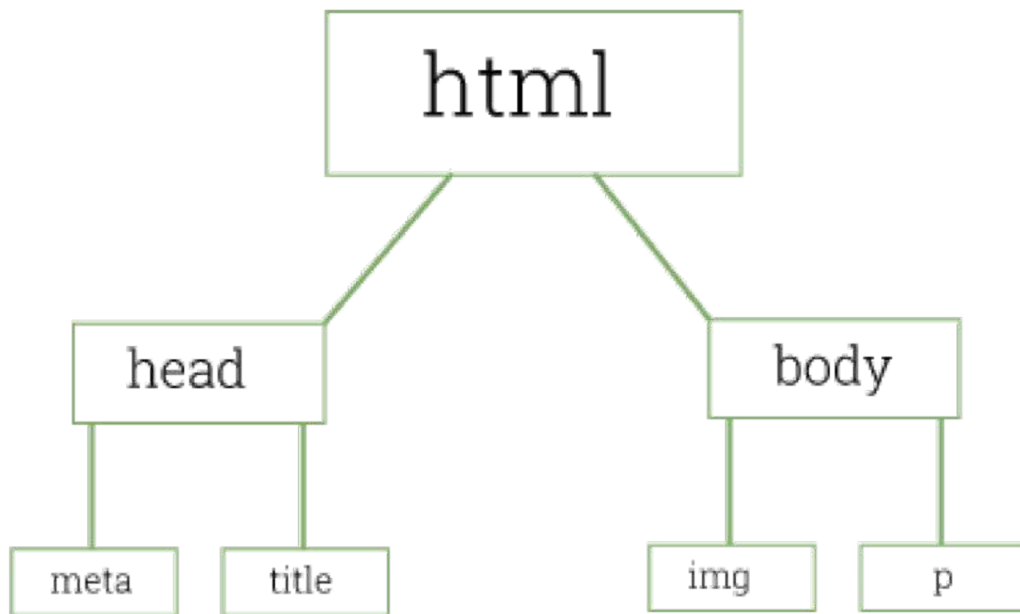


Building the CSSOM

- ▶ CSSOM stands for "CSS Object Map". It is basically a map of what styles should be applied to different parts of the page according to the CSS. The CSSOM maps out the way things should be presented using styles.



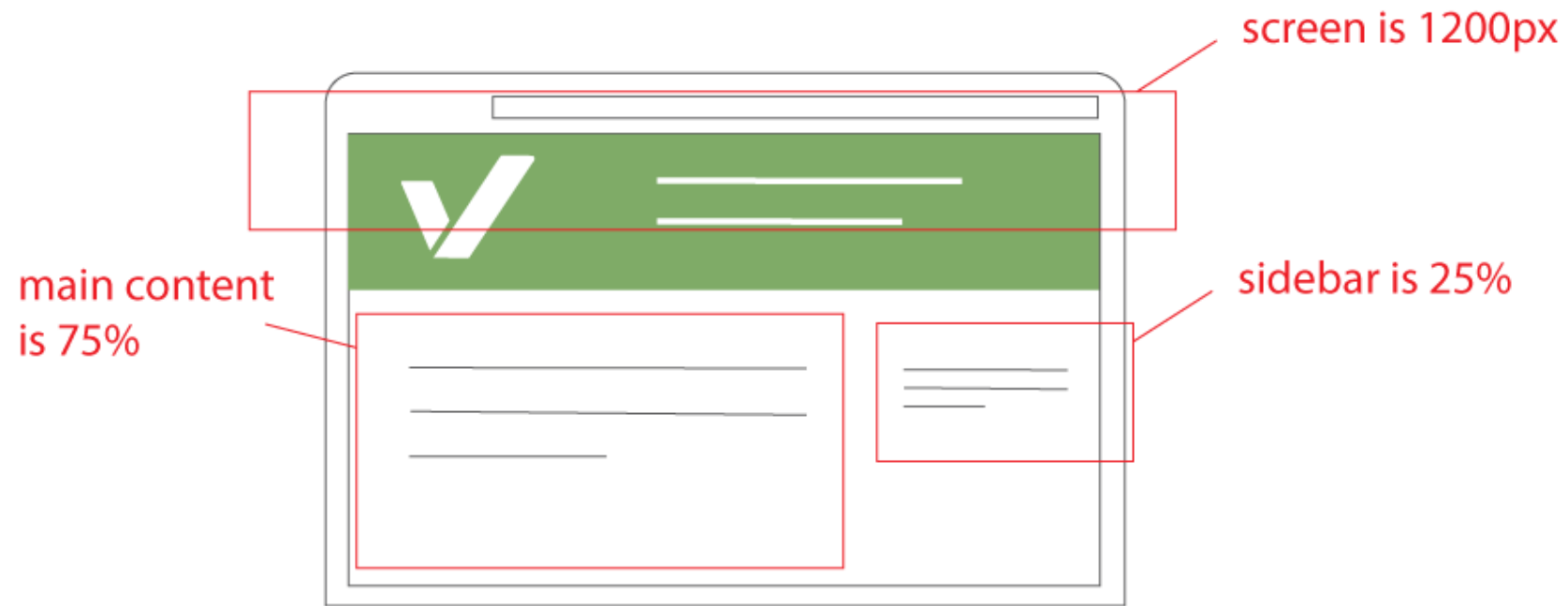
Building the render tree



Render

- ▶ After all of the above steps have been performed the browser can now finally put something up on the screen.
- ▶ There are two main things that happen here...
- ▶ Layout
- ▶ Paint

Render - Layout



Summary

- ▶ We broke the process of displaying a webpage into four parts...
- ▶ Request
- ▶ Response
- ▶ Build
- ▶ Render

Reference

- ▶ <https://varvy.com/pagespeed/display.html>
- ▶ <https://varvy.com/http/basics.html>