

[320] Web 3: Selenium

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Review Decorators

how many functions get defined total?

```
def cache (fn) :  
    results = {}  
    def wrapper (*args) :  
        if not args in results:  
            rv = fn (*args)  
            results[args] = rv  
        return results[args]  
    return wrapper
```

how many results dicts will there be?

@cache

```
def add (x, y) :  
    print ("ADD")  
    return x+y
```

@cache

```
def range_sum (limit) :  
    total = 0  
    for i in range (limit) :  
        total += i  
    return total
```

what is printed?

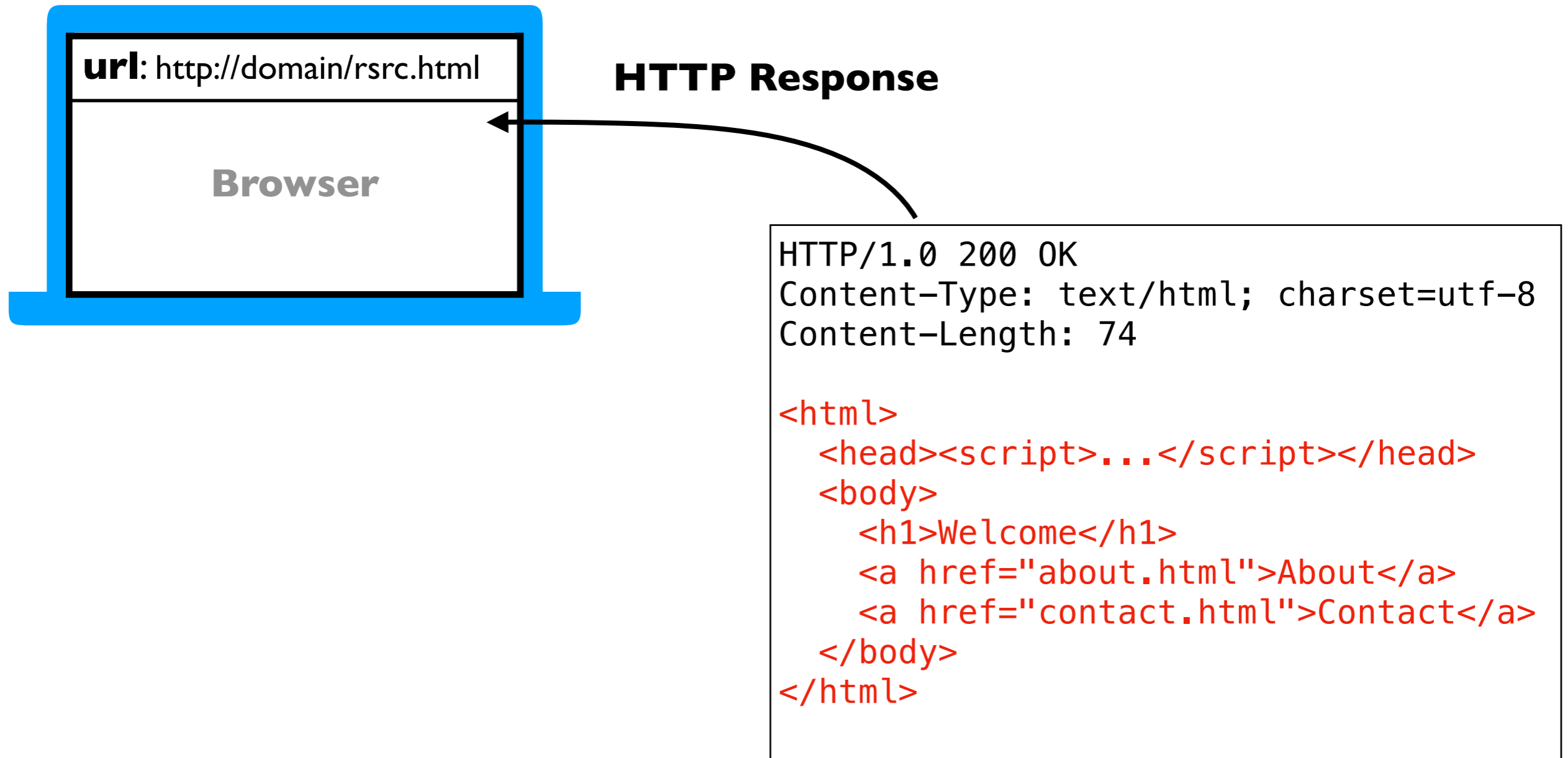
```
print (add (1, 2))  
print (add (3, 4))  
print (add (1, 2))
```

```
print (range_sum (50000000)) #1  
print (range_sum (50000000)) #2
```

which call is faster?

Review Document Object Model

What does a web browser do when it gets some HTML in an HTTP response?



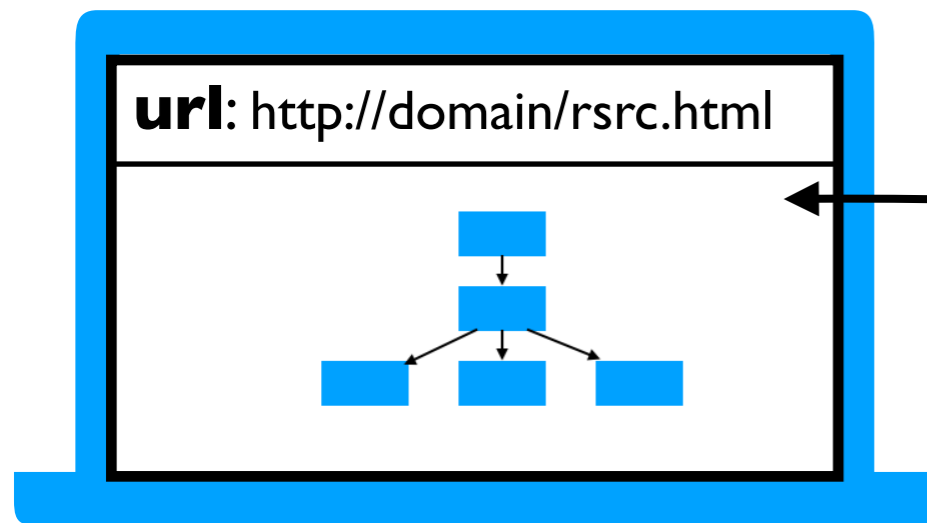
url: http://domain/rsrc.html

```
<html>
  <body>
    <h1>Welcome</h1>
    <a href="about.html">About</a>
    <a href="contact.html">Contact</a>
  </body>
</html>
```

HTTP Response

```
HTTP/1.0 200 OK
Content-Type: text/html; charset=utf-8
Content-Length: 74
```

```
<html>
  <head><script>...</script></head>
  <body>
    <h1>Welcome</h1>
    <a href="about.html">About</a>
    <a href="contact.html">Contact</a>
  </body>
</html>
```



HTTP Response

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  </body>
</html>
```

before displaying a page, the browser
uses HTML to generate a Document
Object Model
(DOM Tree)

url: http://domain/rsrc.html

HTTP Response

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HTTP/1.0 200 OK
Content-Type: text/html; charset=utf-8
Content-Length: 74
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  <body>
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    <a href="about.html">About</a>
    <a href="contact.html">Contact</a>
  </body>
</html>
```

html

body

h1

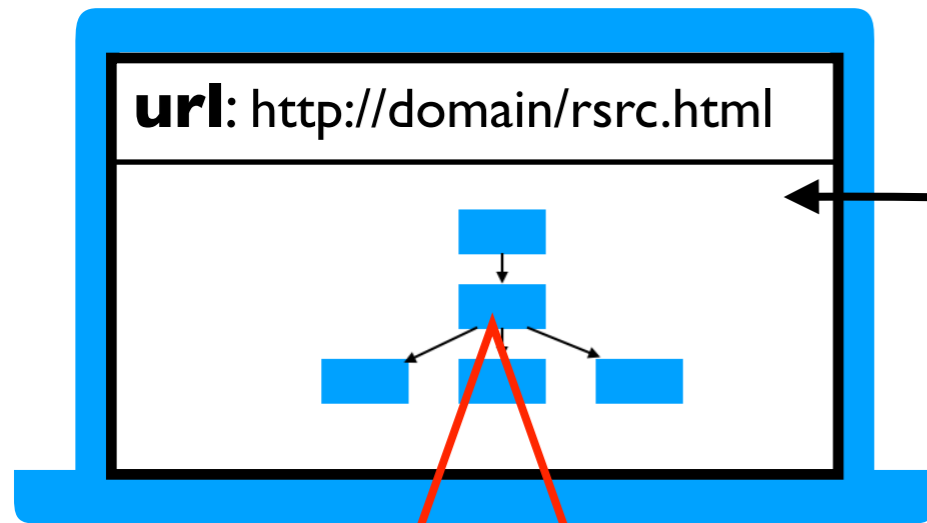
a

a

vocab: elements

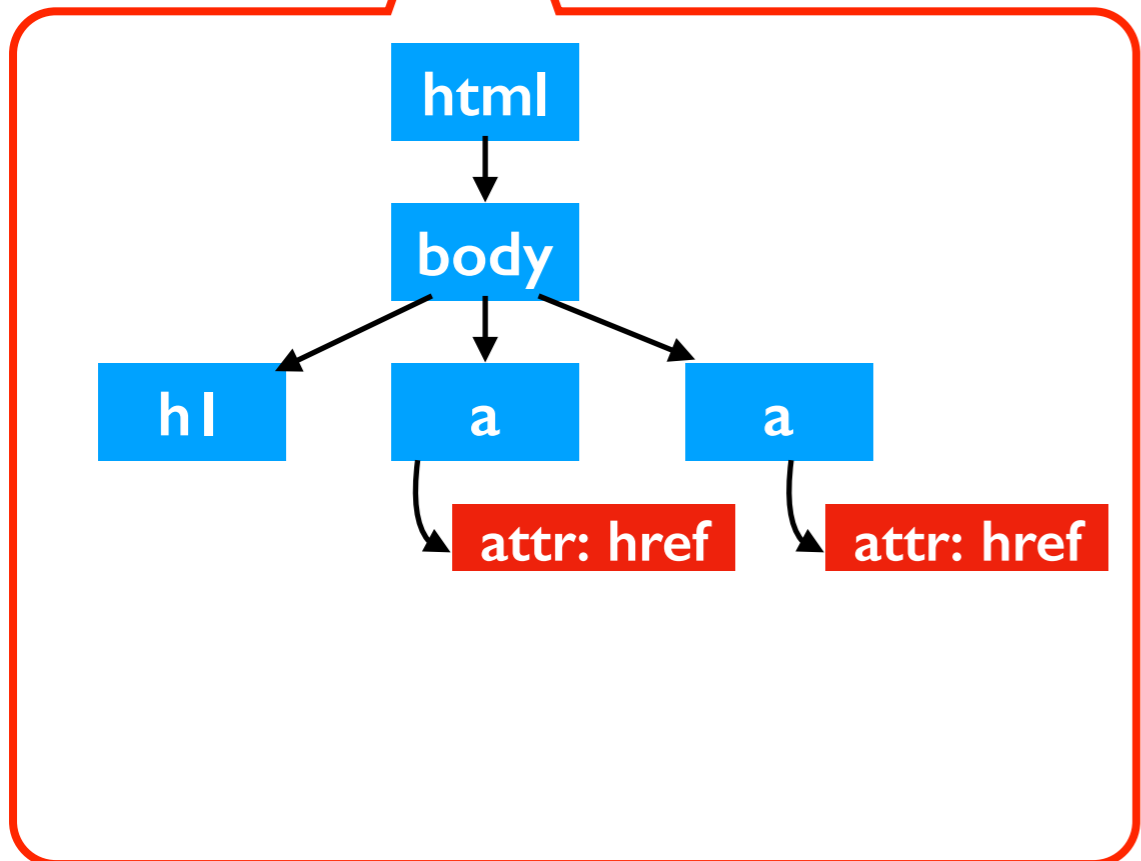
Elements may contain

- attributes



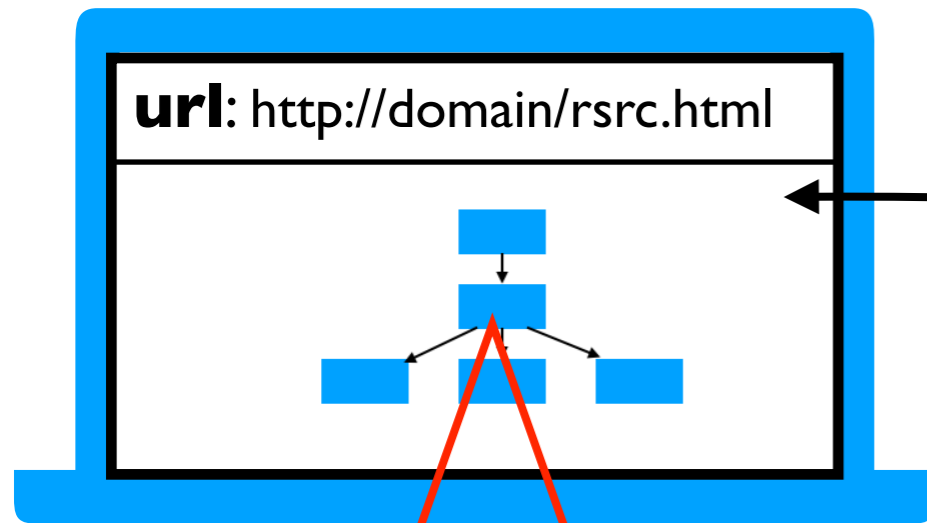
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Elements may contain

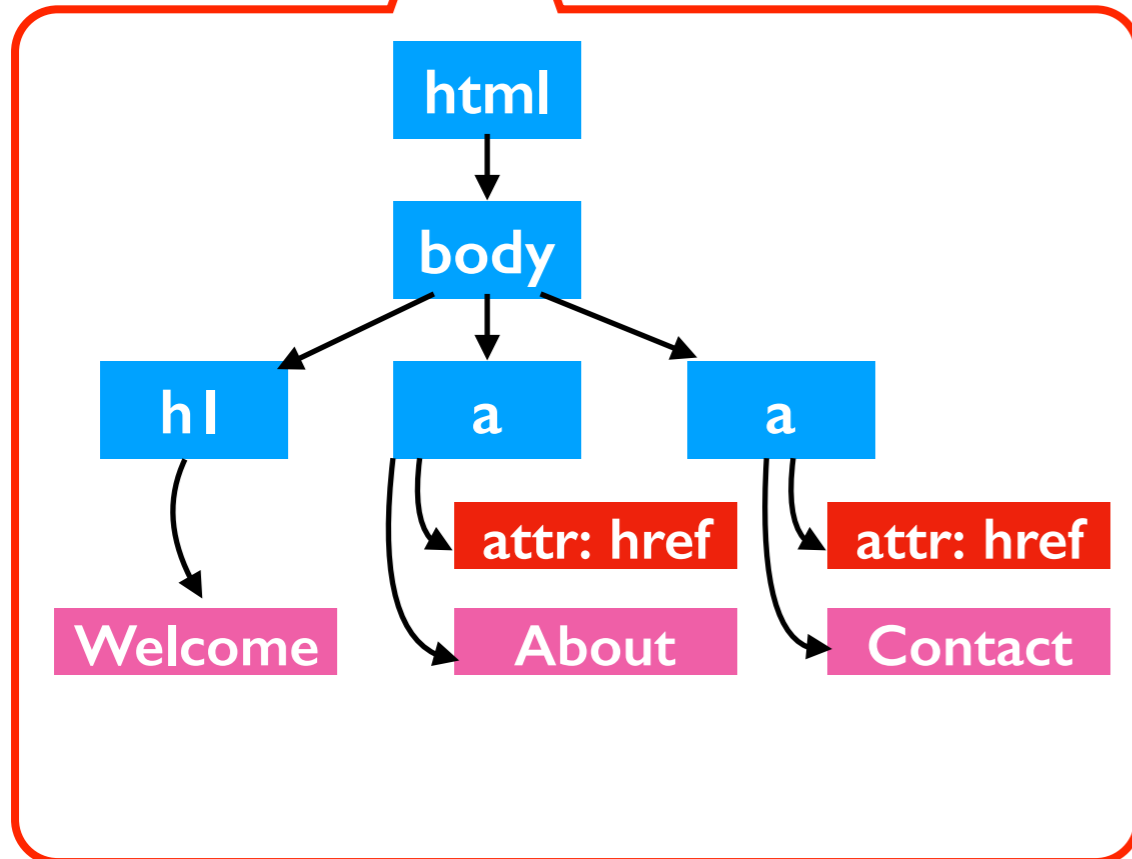
- attributes
- text



HTTP Response

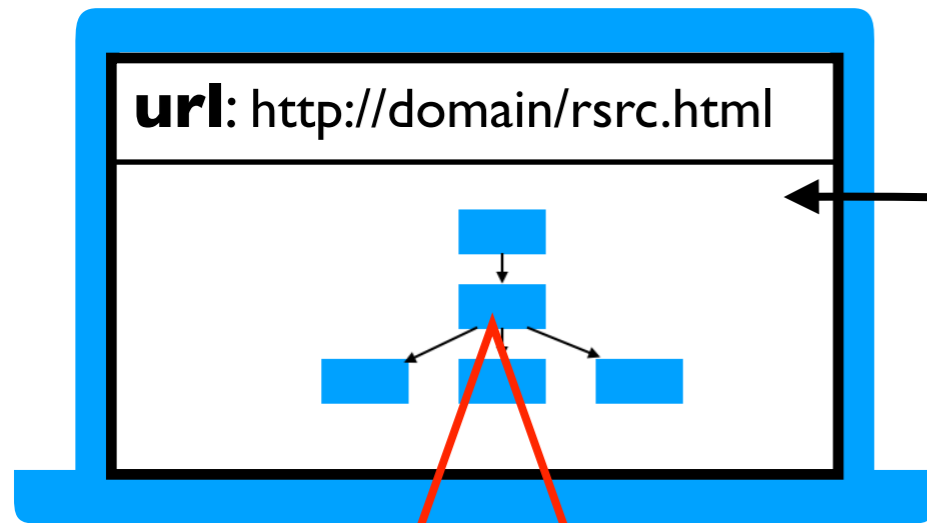
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</html>
```



Elements may contain

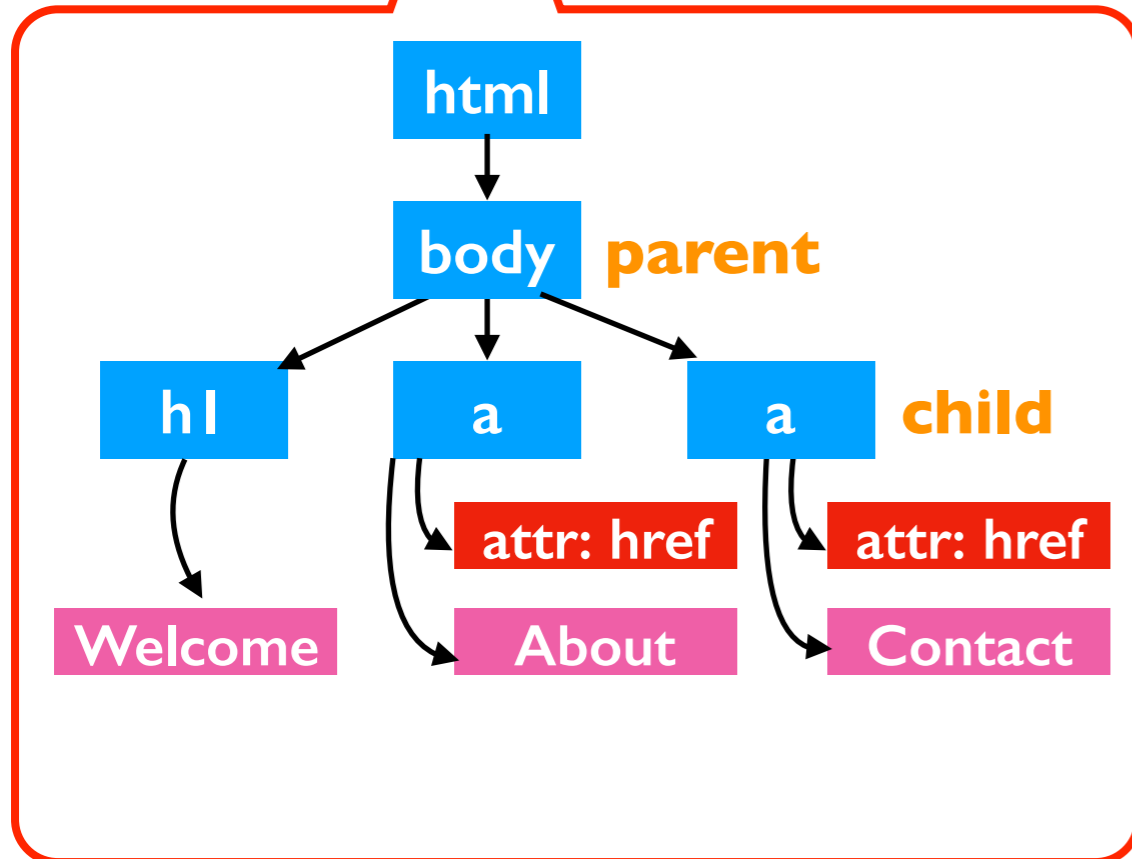
- attributes
- text
- other elements



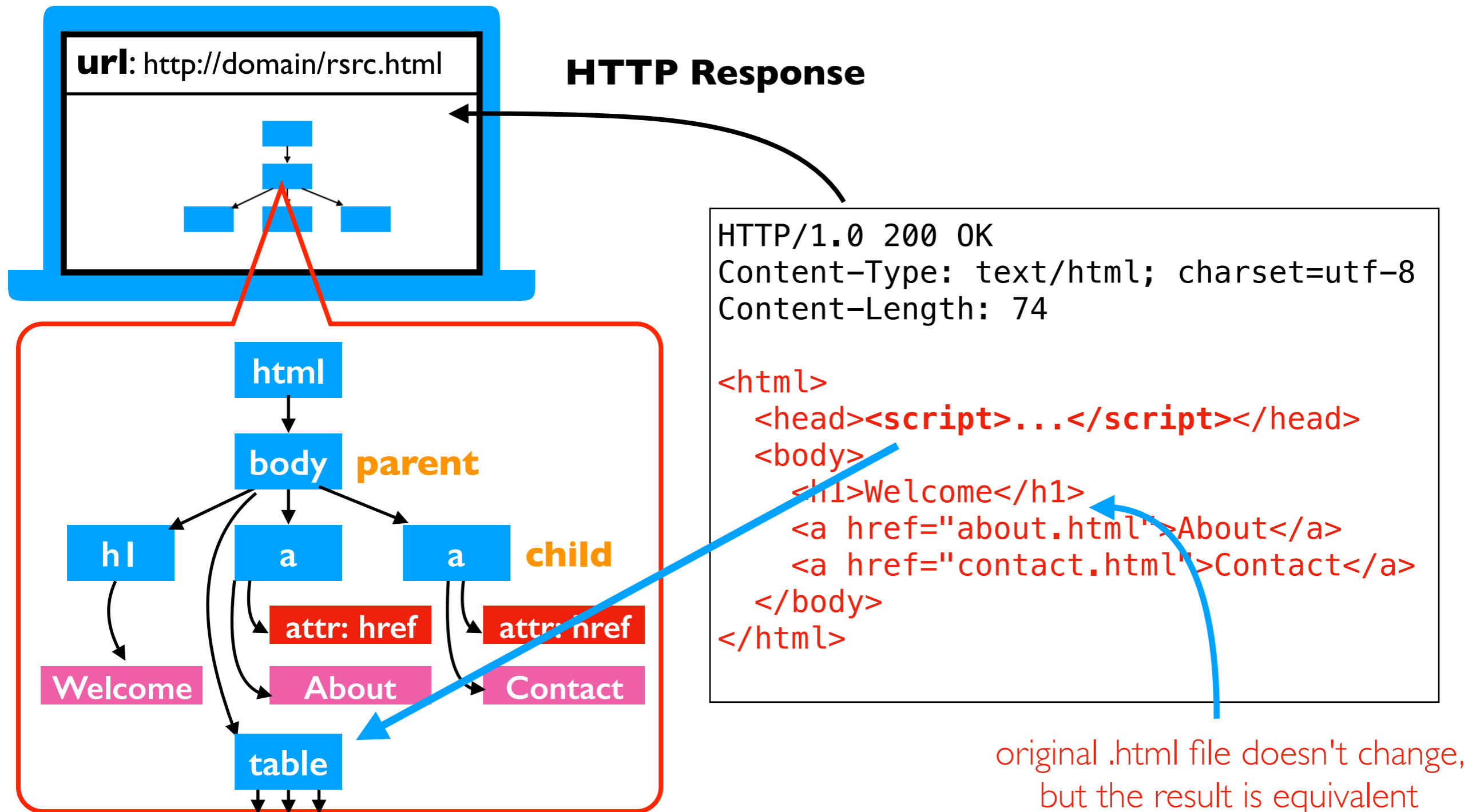
HTTP Response

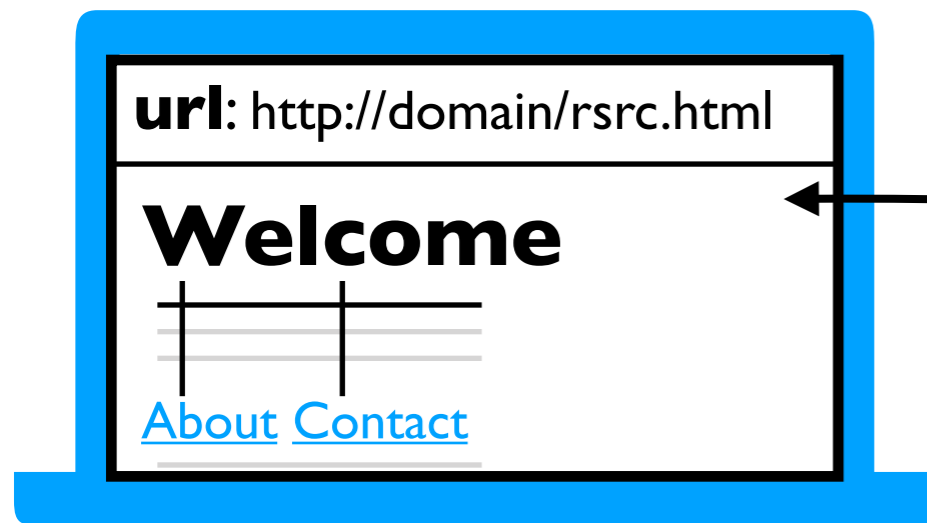
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HTTP/1.0 200 OK
Content-Type: text/html; charset=utf-8
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  <body>
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  </body>
</html>
```



JavaScript (if there's an engine to execute it) may directly edit the DOM!





HTTP Response

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</html>
```

browser renders (displays) the
DOM tree, based on original file
and any JavaScript changes

Web Scraping: Simple and Complicated

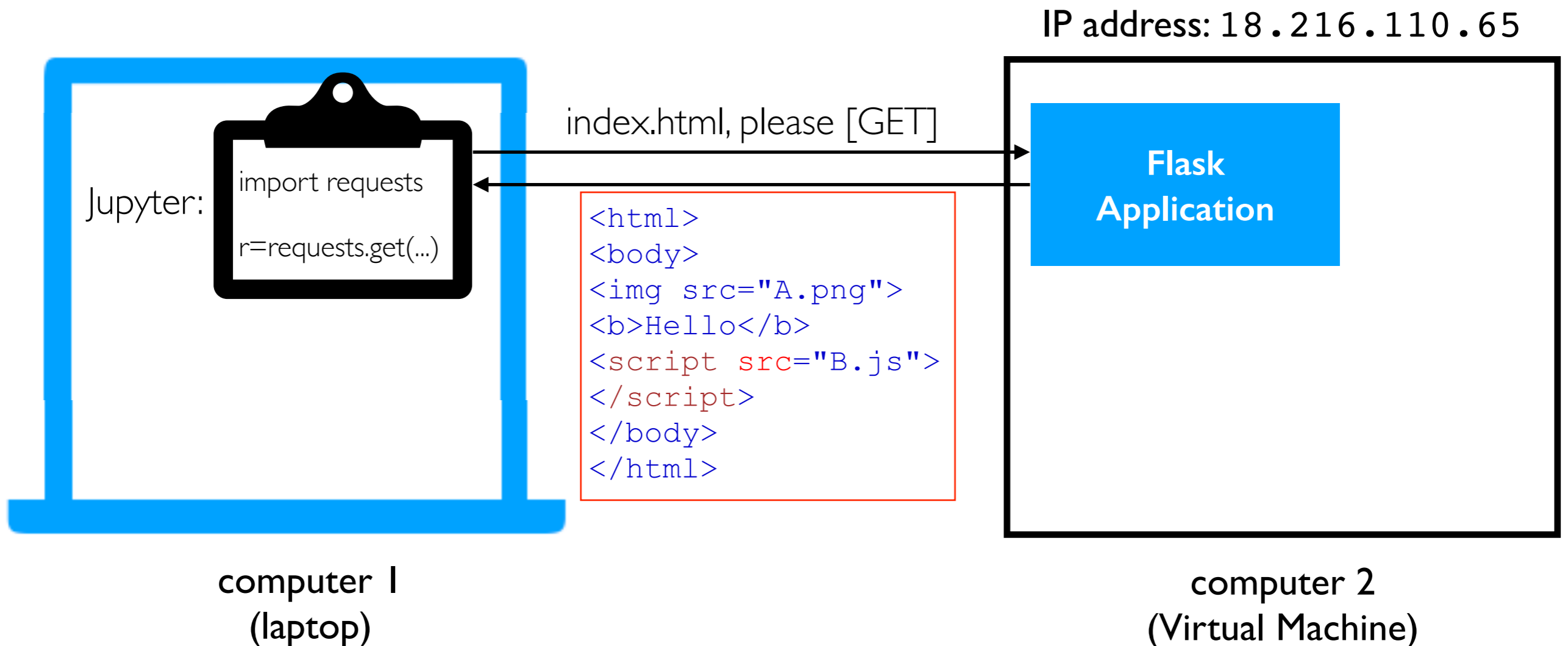
requests vs. Selenium

requests module

- can fetch .html, .js, .etc file

Selenium

- can fetch .html, .js, .etc file
- can run a .js file in browser
- can grab HTML version of DOM after JavaScript has modified it



requests vs. Selenium

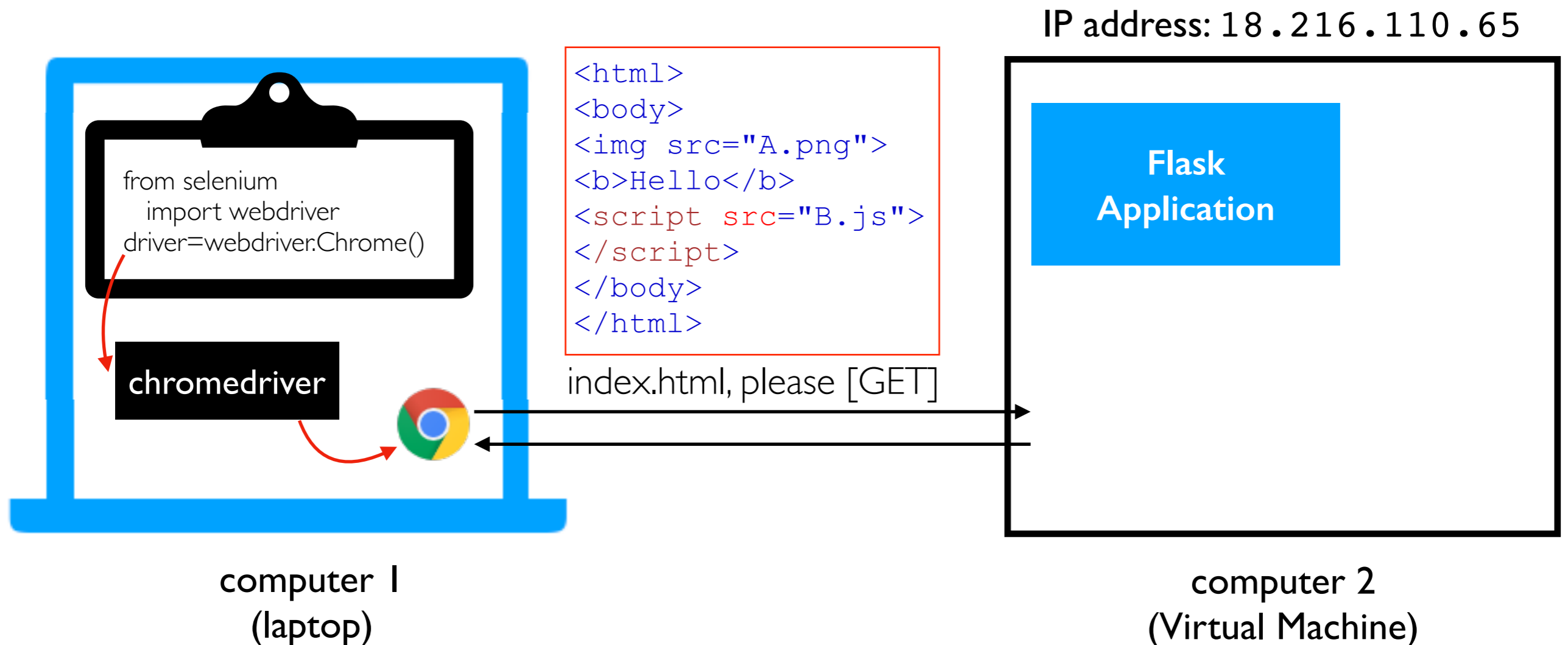
requests module

- can fetch .html, .js, .etc file

Selenium

- can fetch .html, .js, .etc file
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note: Selenium is most commonly used for testing websites, but it works great for tricky scraping too



Tricky Pages

<https://tyler.caraza-harter.com/cs320/s20/materials/lec-19/scrape.html>

Install

Selenium Install

<https://chromedriver.chromium.org/downloads>

Current Releases

- If you are using Chrome version 81, please download [ChromeDriver 81.0.4044.20](#)
- If you are using Chrome version 80, please download [ChromeDriver 80.0.3987.106](#)
- If you are using Chrome version 79, please download [ChromeDriver 79.0.3945.36](#)
- For older version of Chrome, please see below for the version of ChromeDriver that supports it.

pip install selenium

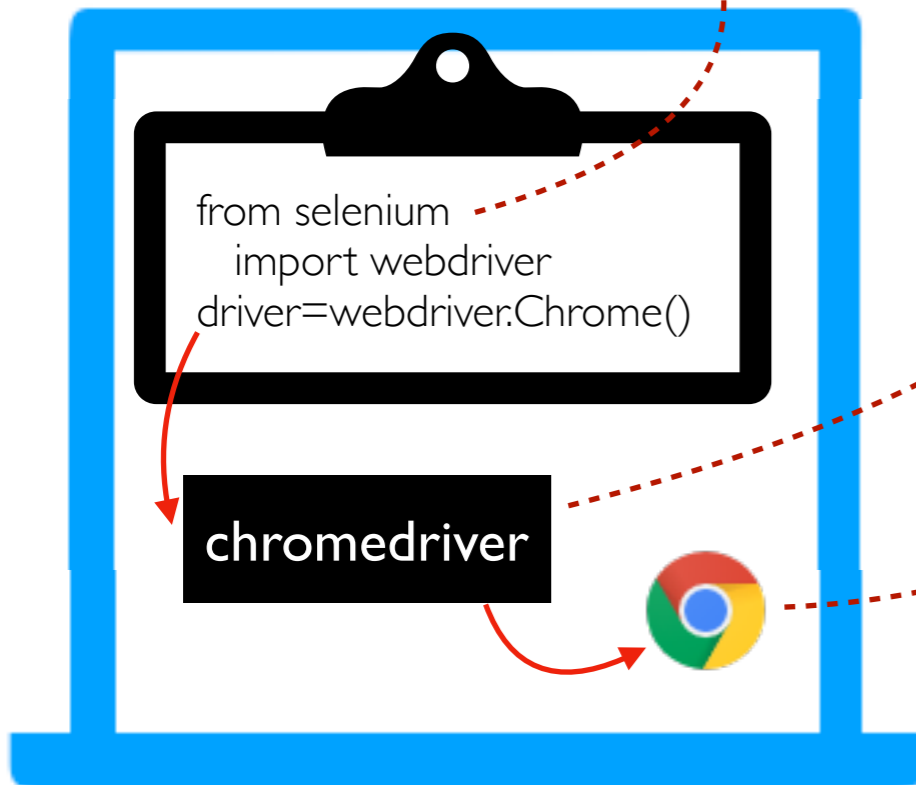
```
wget https://chromedriver.storage.googleapis.com/80.0.3987.106/chromedriver_linux64.zip
unzip chromedriver_linux64.zip
echo $PATH
mv chromedriver ~/.local/bin/
```

```
from selenium
import webdriver
driver=webdriver.Chrome()
```

chromedriver

sudo apt install chromium-browser

computer I
(laptop)



Selenium Install

<https://chromedriver.chromium.org/downloads>

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- For older version of Chrome, please see below for the version of ChromeDriver that supports it.

pip install selenium

```
wget https://chromedriver.storage.googleapis.com/80.0.3987.106/chromedriver_linux64.zip  
unzip chromedriver_linux64.zip  
echo $PATH  
mv chromedriver ~/.local/bin/
```

```
from selenium  
import webdriver  
driver=webdriver.Chrome()
```

chromedriver



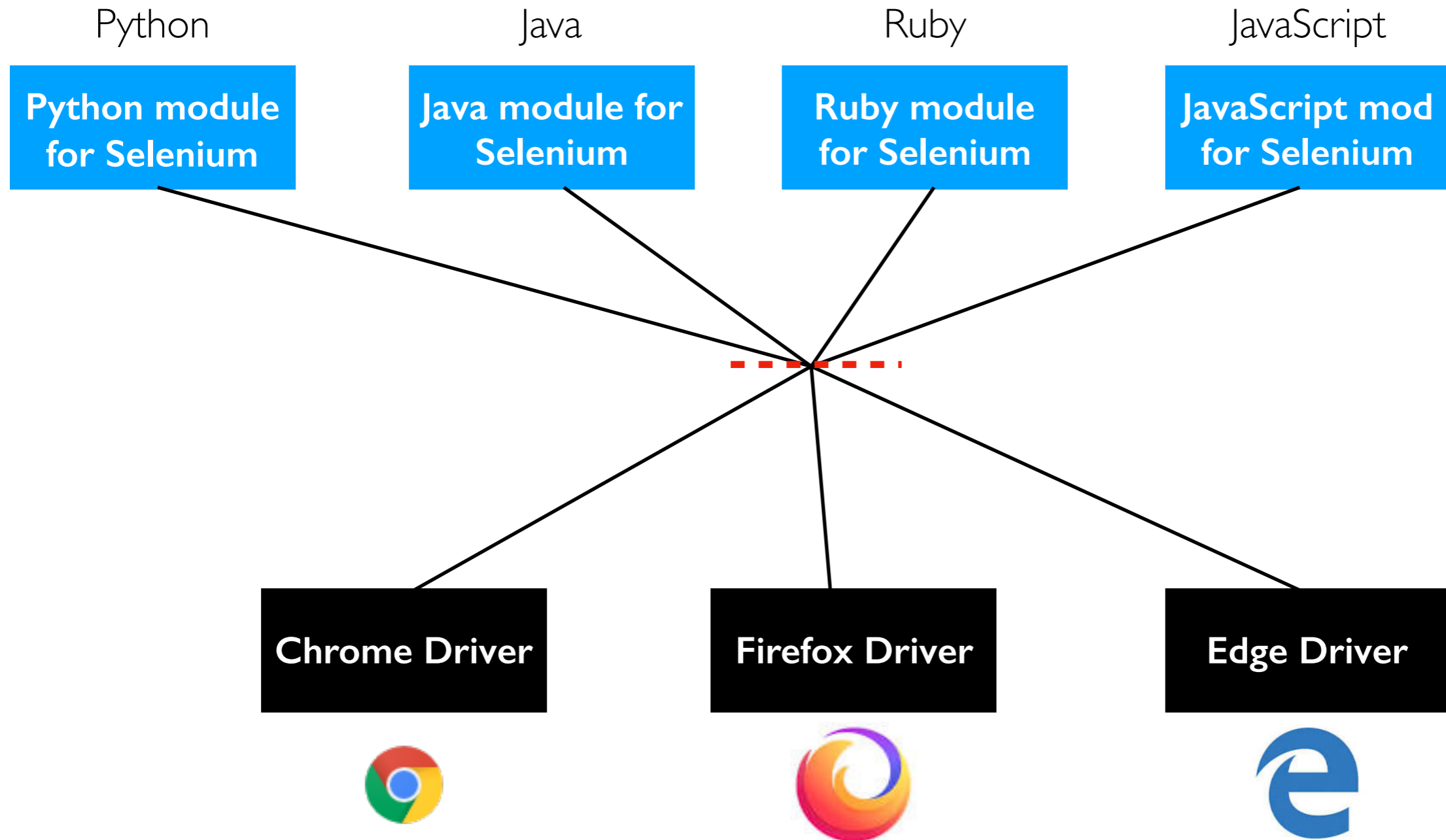
sudo apt install chromium-browser

Check...

```
trh@instance-1:/tmp$ chromium-browser --version  
Chromium 80.0.3987.87 Built on Ubuntu , ...  
trh@instance-1:/tmp$ chromedriver --version  
ChromeDriver 80.0.3987.106 (...)
```

computer I
(laptop)

Why Drivers?



Examples

Starter Code

```
from selenium import webdriver
from selenium.webdriver.chrome.options import Options
from selenium.common.exceptions import NoSuchElementException

options = Options()
#options.headless = True
b = webdriver.Chrome(options=options)    open browser window

b.get(????)    go to a URL

print(b.page_source)    get HTML for current page (including JavaScript changes)

try:    search for id=???? attributes
    elem = browser.find_element_by_id(element_id)
    print("found it")
except NoSuchElementException:    no such element
    print("couldn't find it")

b.close()
```

Example 1a: Late Loading Table (page 1.html)

Welcome

Here's a table

A	B	C
1	2	3
4	5	6

And another one...

x	y
0	1
2	3
4	5
6	7
8	9
10	11
12	13
14	15
16	17
18	19

← added after 1 second

Example 1b: Headless Mode and Screenshots

```
from selenium import webdriver
from selenium.webdriver.chrome.options import Options
from selenium.common.exceptions import NoSuchElementException

options = Options()
options.headless = True
b = webdriver.Chrome(options=options)

b.get('????')

from IPython.core.display import Image
b.save_screenshot("out.png")
Image("out.png")

b.close()
```


Example 2: Auto-Clicking Buttons

```
from selenium import webdriver
from selenium.webdriver.chrome.options import Options
from selenium.common.exceptions import NoSuchElementException

options = Options()
options.headless = True
b = webdriver.Chrome(options=options)

b.get('????')

btn = b.find_element_by_id("BTN_ID")
btn.click()

b.close()
```

Keep clicking...

name	formed	dissipated	mph	damage	deaths
Baker	08/18/1950	09/01/1950	105	2.55M	38
Camille	08/14/1969	08/22/1969	175	1.42B	259
Eloise	09/13/1975	09/24/1975	125	560M	80
Frederic	08/29/1979	09/15/1979	130	1.77B	12
Elena	08/28/1985	09/04/1985	125	1.3B	9
Opal	09/27/1995	10/06/1995	150	4.7B	63
Danny	07/16/1997	07/27/1997	80	100M	4
Ivan	09/02/2004	09/25/2004	165	26.1B	92
Dennis	07/04/2005	07/18/2005	150	3.98B	76

Show More!

auto click 

Example 3: Entering Passwords

```
from selenium import webdriver
from selenium.webdriver.chrome.options import Options
from selenium.common.exceptions import NoSuchElementException

options = Options()
options.headless = True
b = webdriver.Chrome(options=options)

b.get("????")

pw = b.find_element_by_id("pw")
pw.send_keys("fido")

b.close()
```

Sign In to View Table

Password:

Table...

name	formed	dissipated	mph	damage	deaths
Baker	08/18/1950	09/01/1950	105	2.55M	38
Camille	08/14/1969	08/22/1969	175	1.42B	259
Eloise	09/13/1975	09/24/1975	125	560M	80
Frederic	08/29/1979	09/15/1979	130	1.77B	12

<https://tyler.caraza-harter.com/cs320/s20/materials/lec-19/page3.html>

Example 4: Many Queries

Give Me a Year

Year:

Table...

name	formed	dissipated	mph	damage	deaths
Baker	08/18/1950	09/01/1950	105	2.55M	38
Easy	09/01/1950	09/09/1950	125	3.3M	2
King	10/13/1950	10/20/1950	130	32M	11

<https://tyler.caraza-harter.com/cs320/s20/materials/lec-19/page4.html>

