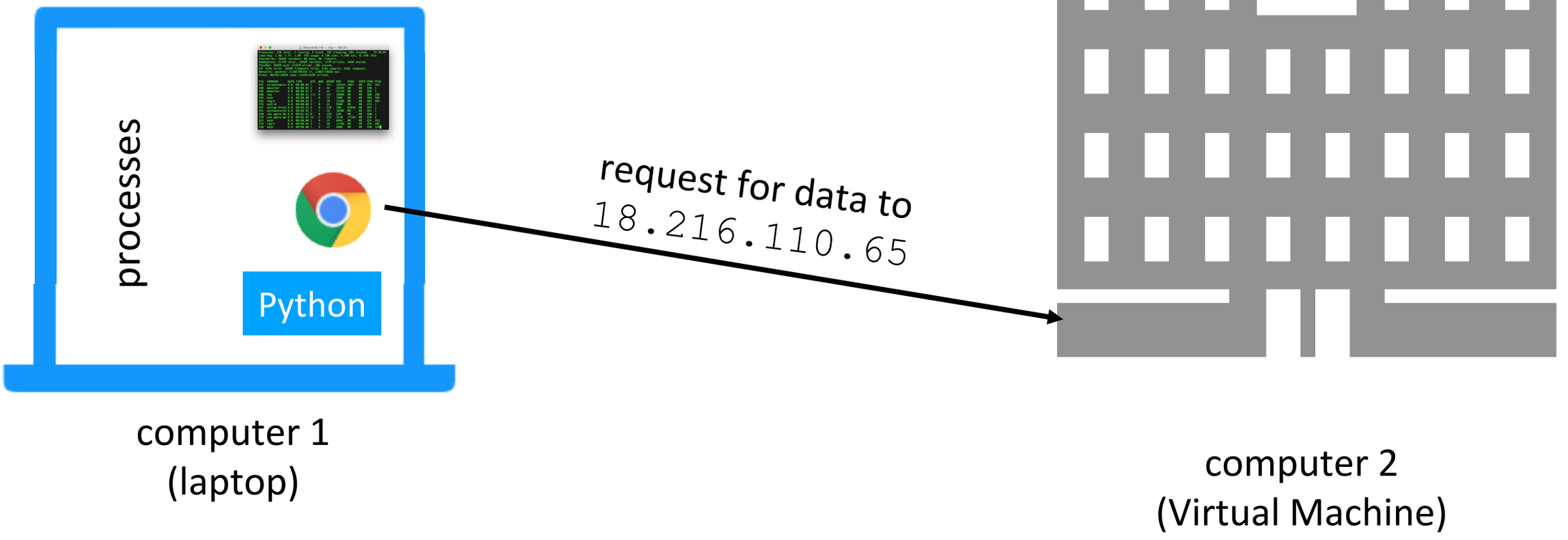
[320] Web 2: Flask

Department of Computer Sciences
University of Wisconsin-Madison

Getting Requests Through

[like street address]

IP address: `18.216.110.65`



computer 1
(laptop)

computer 2
(Virtual Machine)

Scenario: we want to access Jupyter on our virtual machine from our laptop

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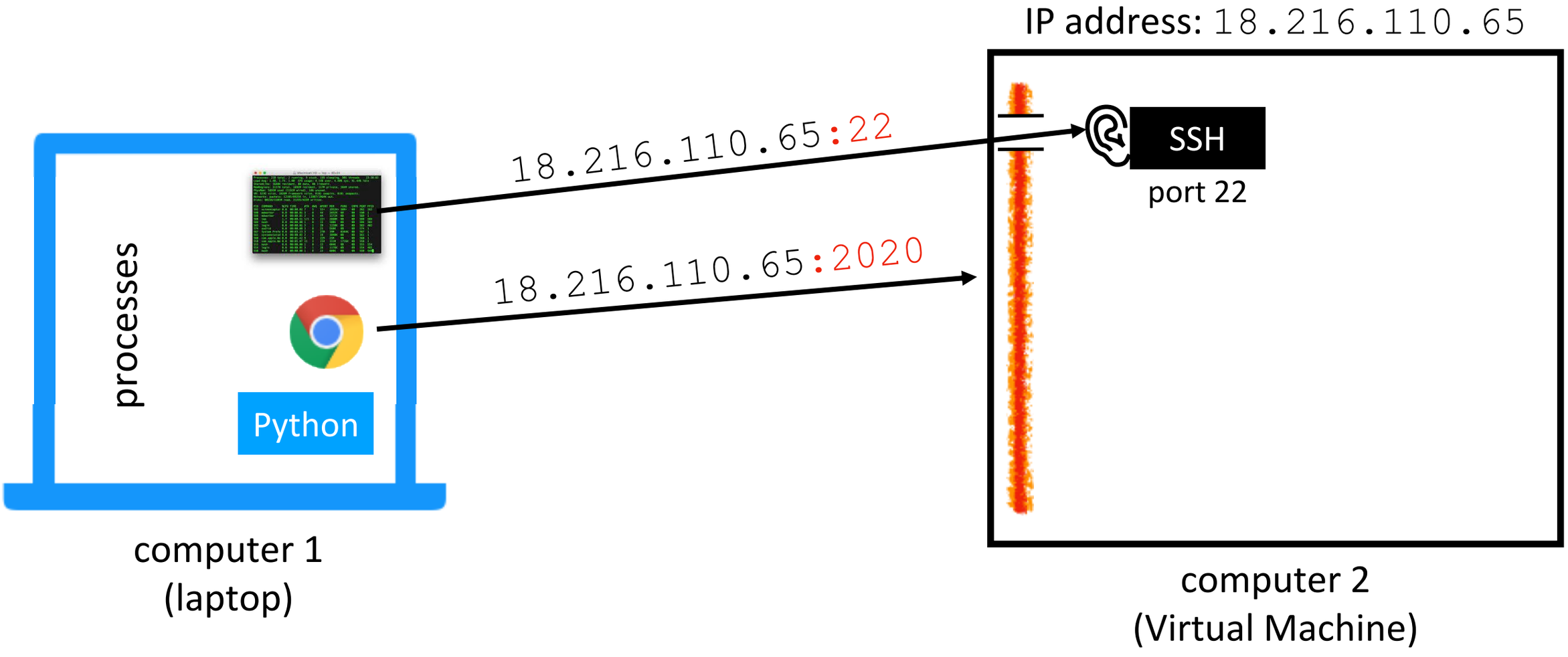
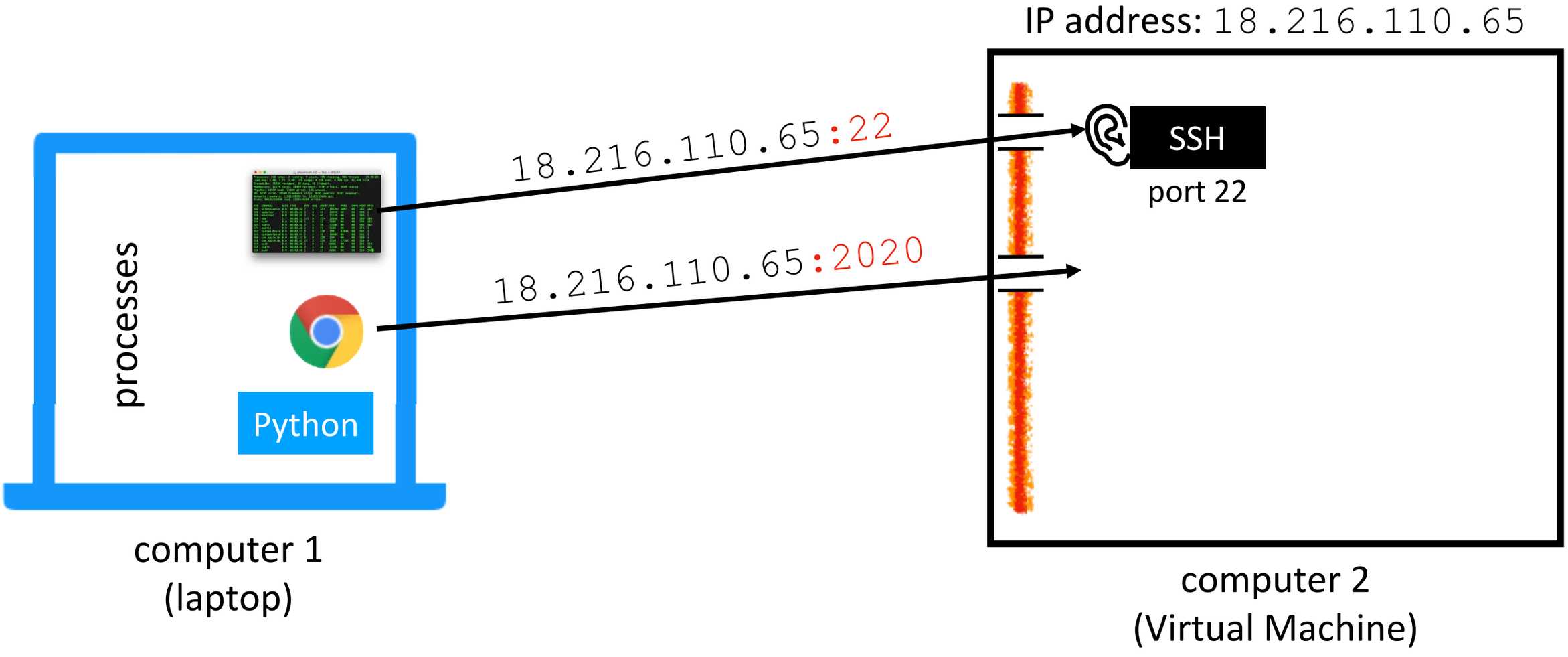


Issue 1: firewall may be blocking some ports (we disabled this in lab)

Getting Requests Through

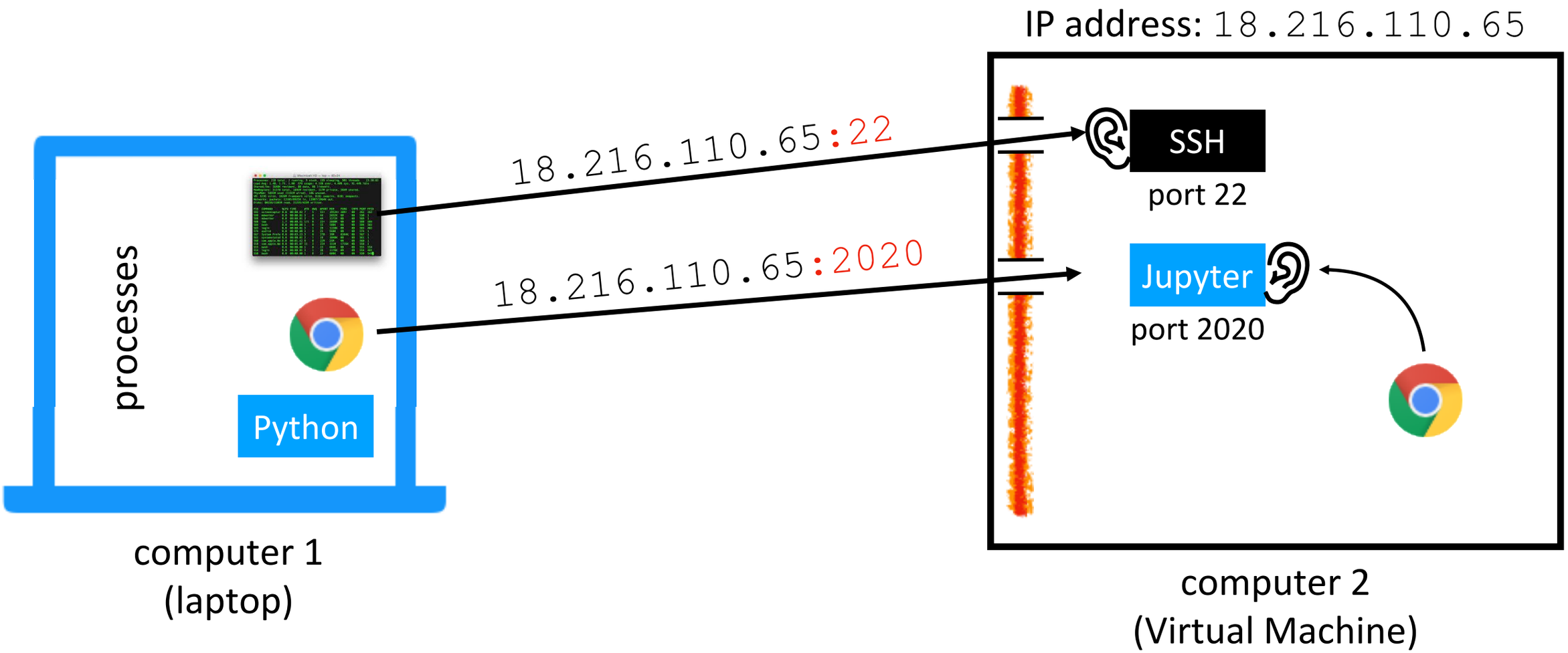


Issue 2: there might not be any process listening on port 2020

Getting Requests Through

[127.0.0.1 means "localhost", the default]

Start command: python3 -m notebook --no-browser **--ip=127.0.0.1** --port=2020

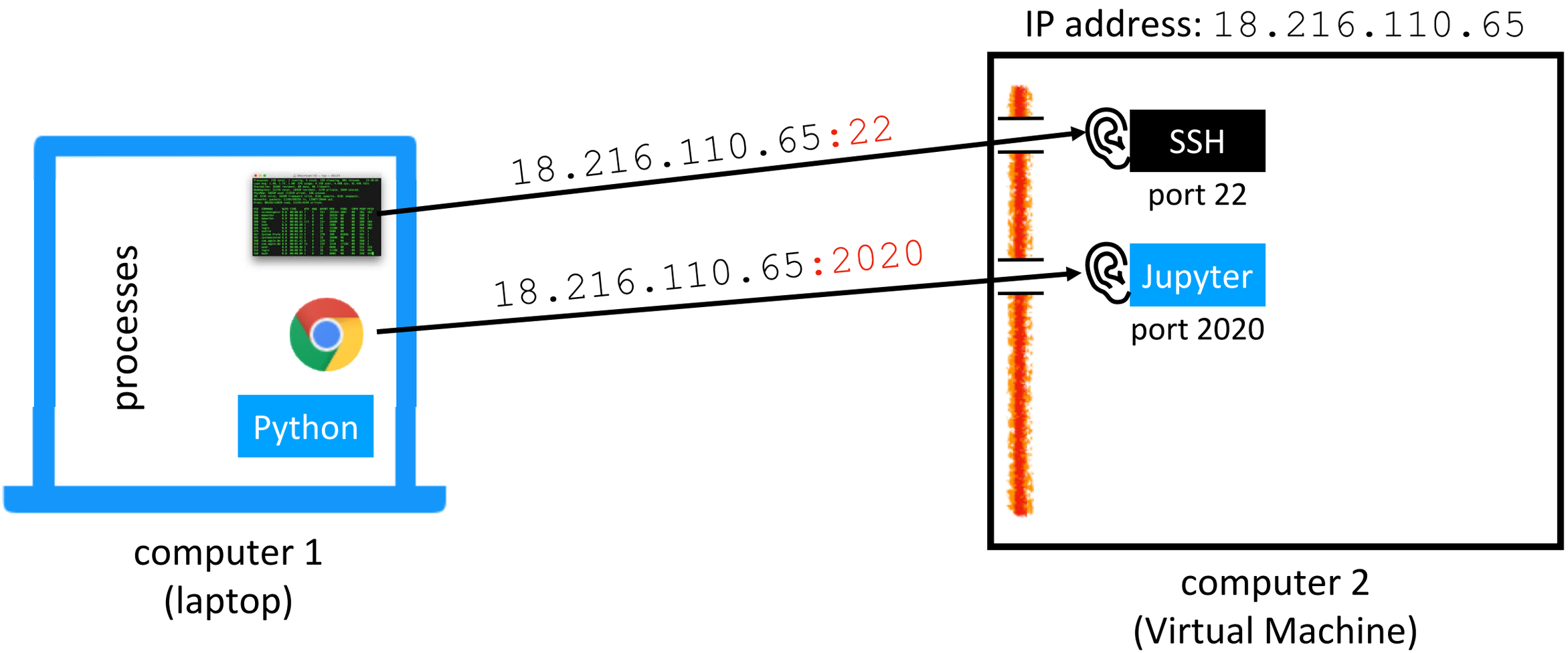


Issue 3: the process may only be listening for local (not external) requests

Getting Requests Through

[0.0.0.0 means all IP addresses]

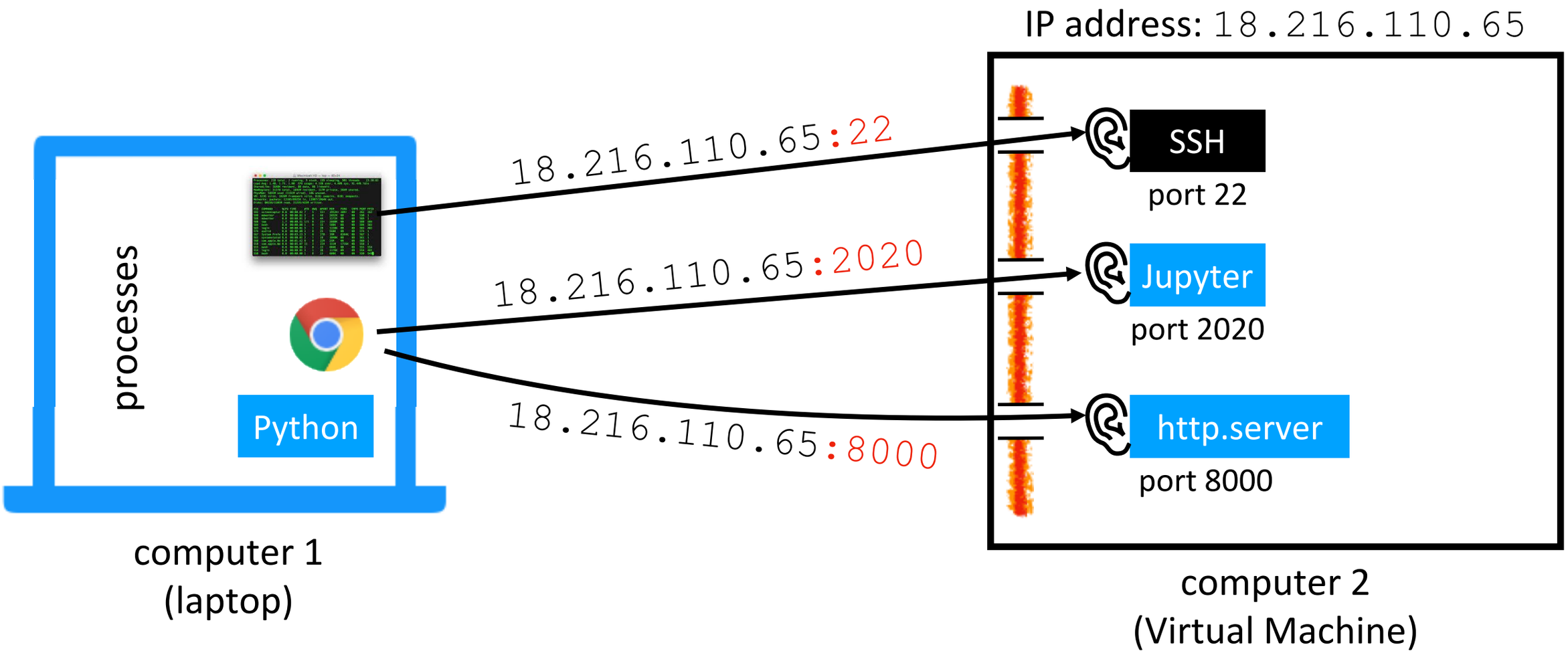
Start command: python3 -m notebook --no-browser **--ip=0.0.0.0** --port=2020



Success: Jupyter is listening for all 2020 requests, and the firewall isn't blocking them!

Getting Requests Through

Start command: python3 -m notebook --no-browser **--ip=0.0.0.0** --port=2020

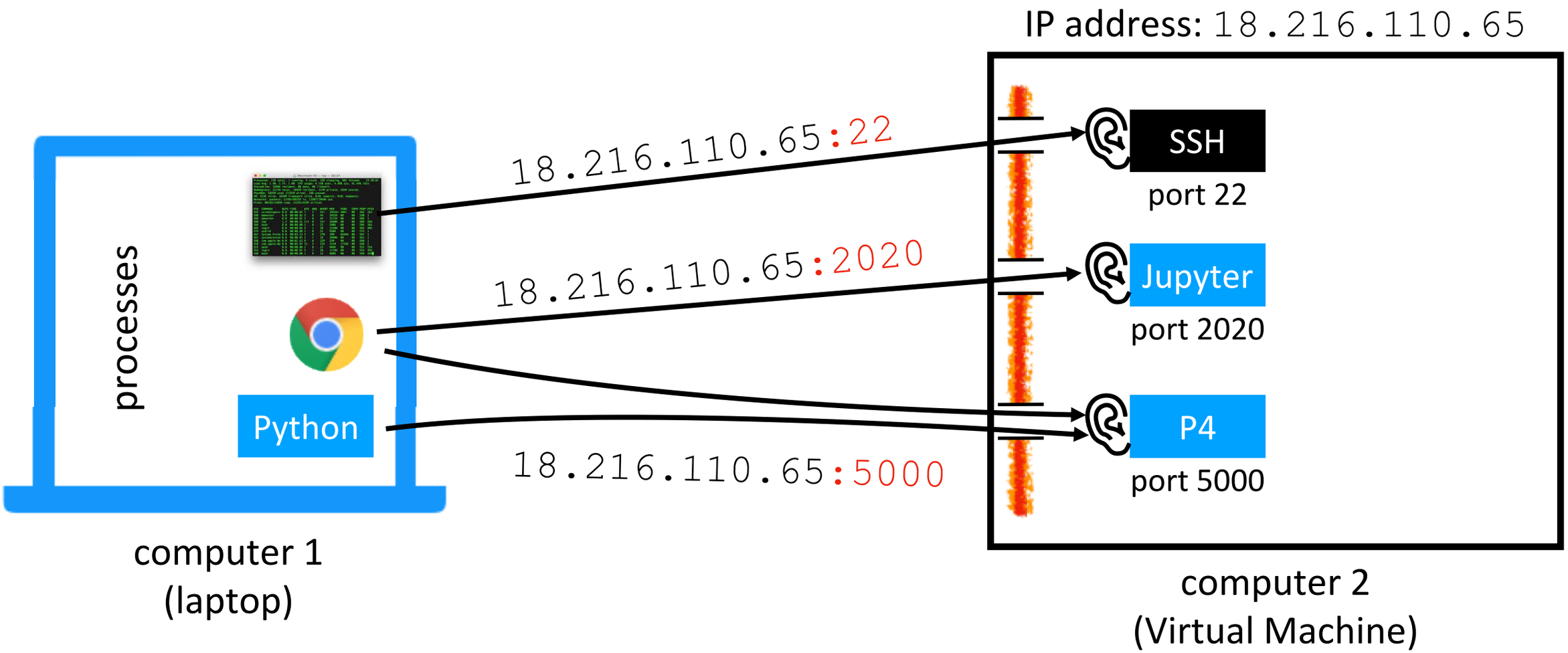


Demo: start web server with http.server

```
mkdir -p demo
cd demo
echo "<b>Hello</b> world!" > index.html
sudo python3 -m http.server --bind=0.0.0.0 8000
```

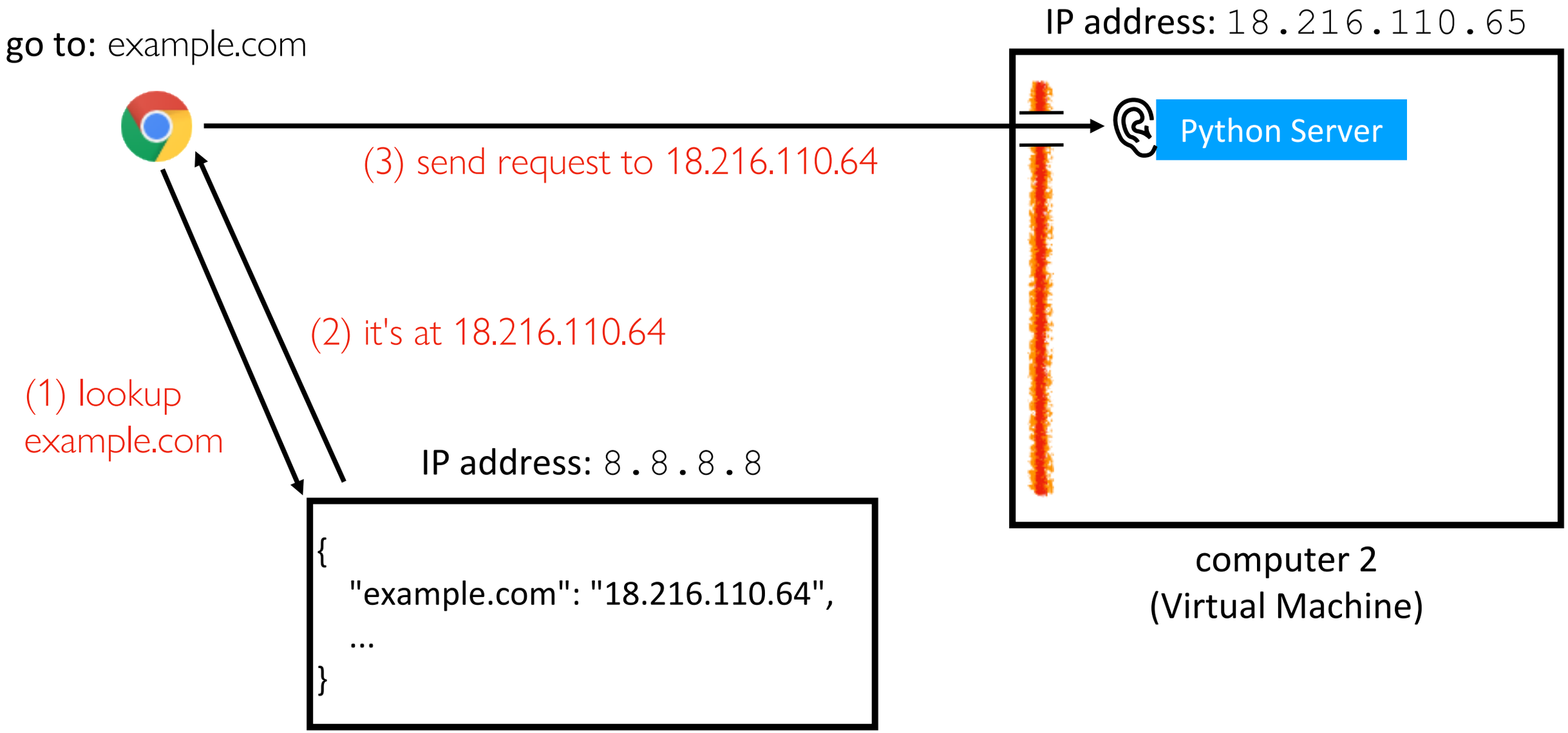
Getting Requests Through

Start command: python3 -m notebook --no-browser **--ip=0.0.0.0** --port=2020



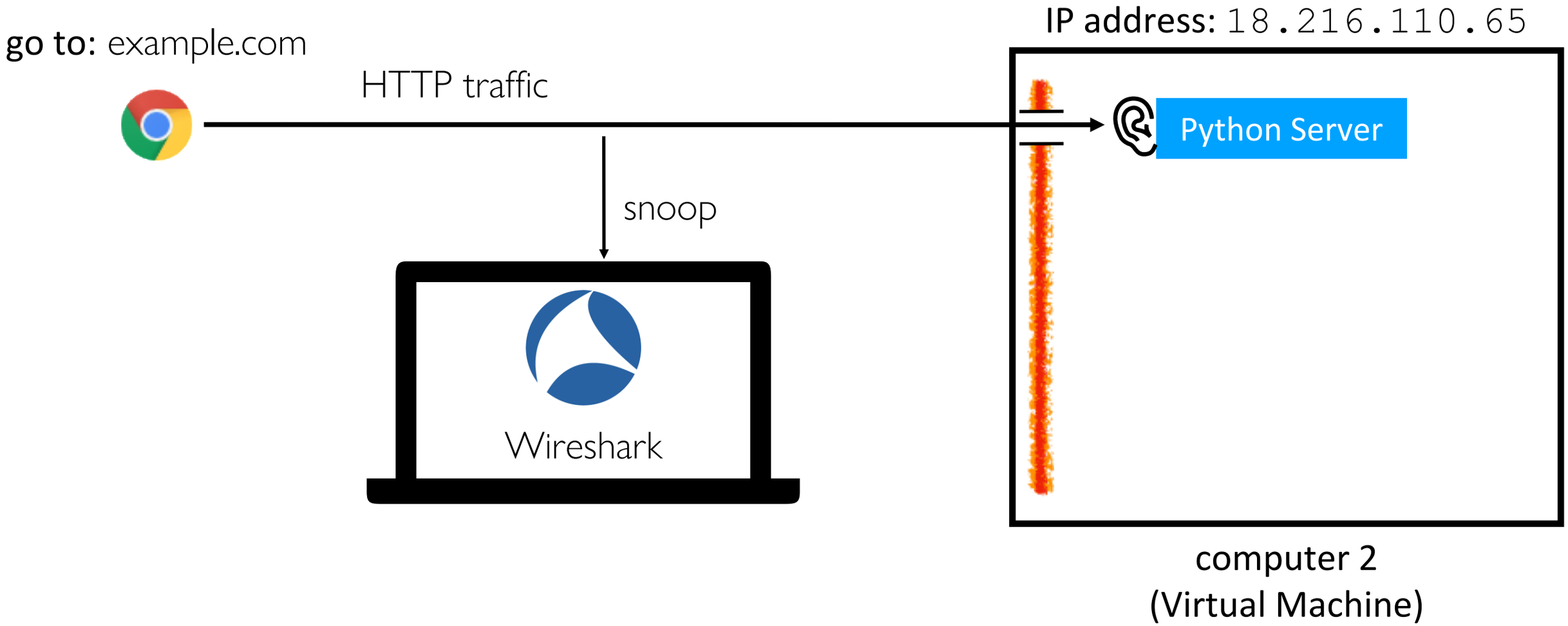
Your Goal: build a web application for P4

DNS (Domain Name Service)

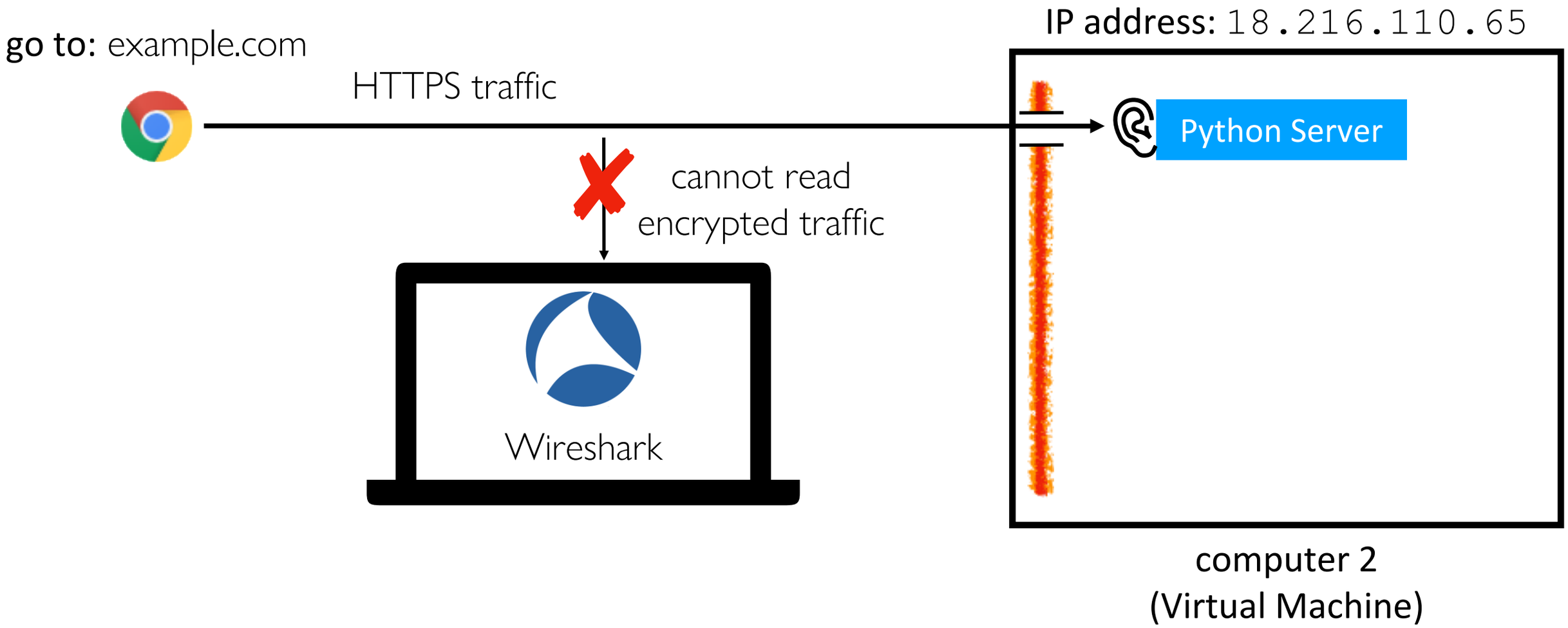


paying to register domain name is ~$10-15 / year

HTTPS: Hypertext Transfer Protocol Secure



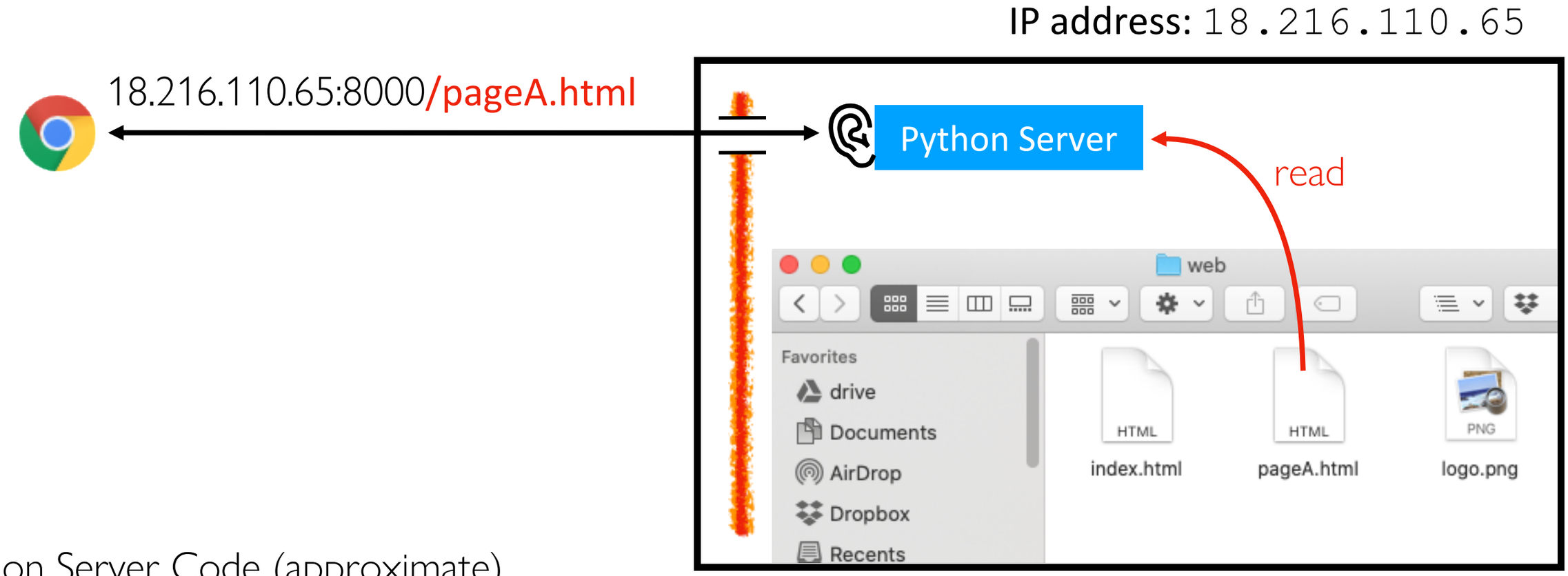
HTTPS: Hypertext Transfer Protocol Secure



paying to register SSL certificate for encryption name is ~$5-10 / year
(or free: https://letsencrypt.org/)

Pages vs. Files

Static Pages Correspond to Files

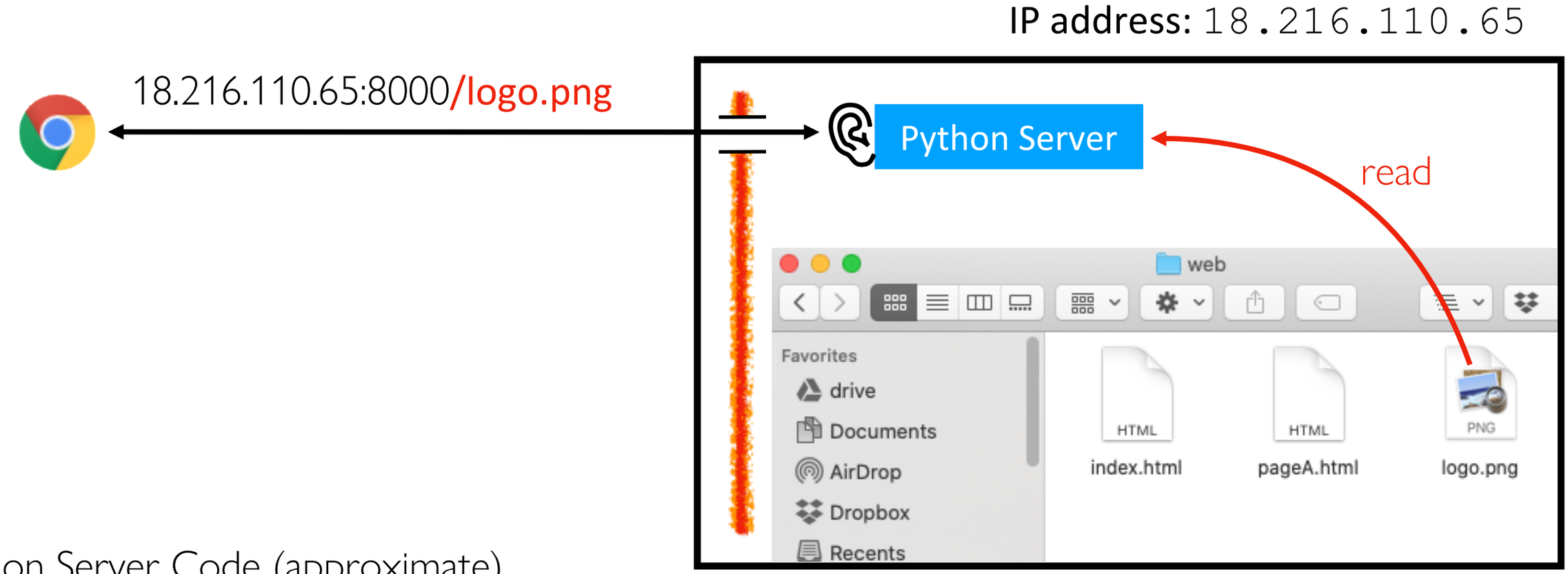


computer 2
(Virtual Machine)

Python Server Code (approximate)

```
def get_page(resource):
    with open(resource, "rb") as f:
        return f.read()
```

Static Pages Correspond to Files



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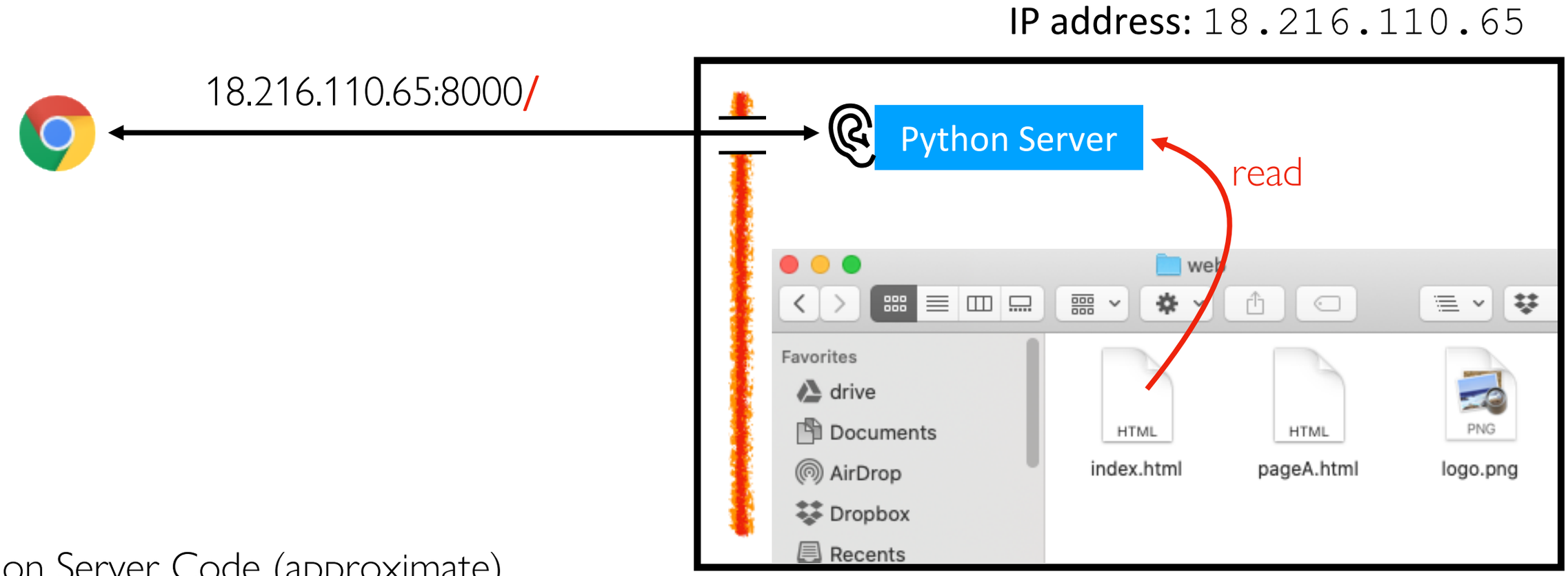


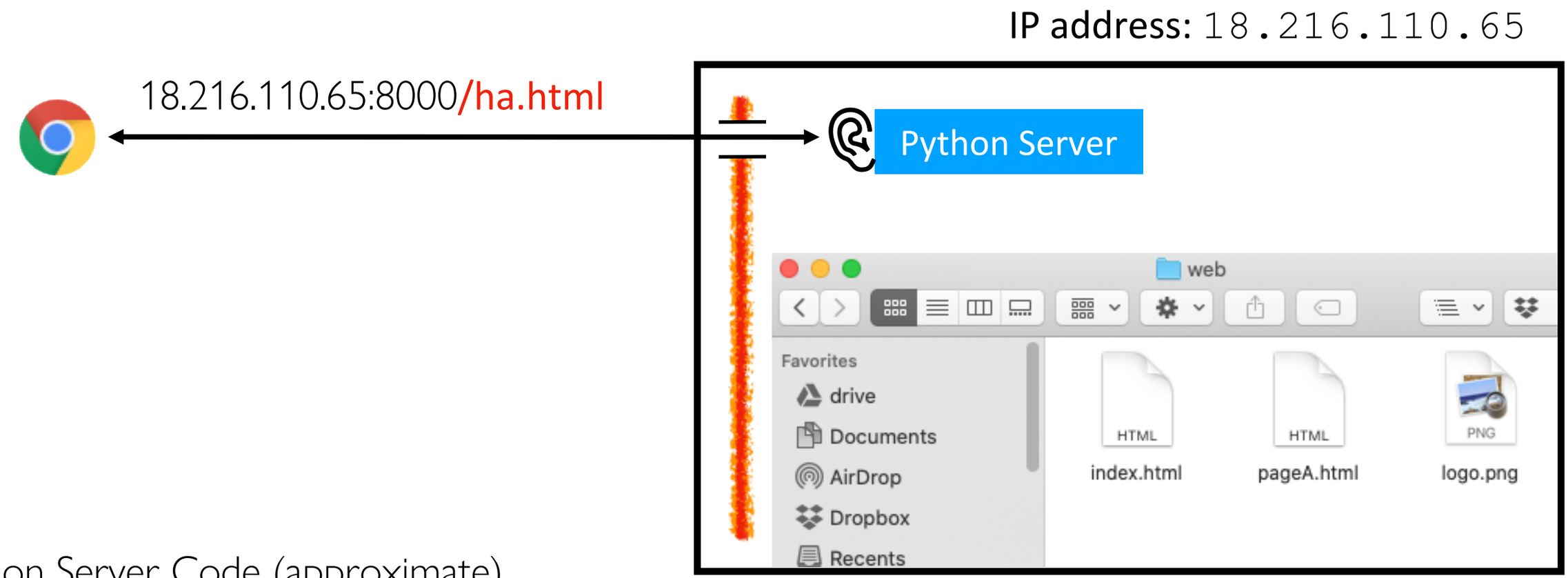
computer 2
(Virtual Machine)

Python Server Code (approximate)

```
def get_page(resource):
    if resource == "/":
        resource = "index.html"

    with open(resource, "rb") as f:
        return f.read()
```

Dynamic Pages Generated by Code



computer 2
(Virtual Machine)

Python Server Code (approximate)

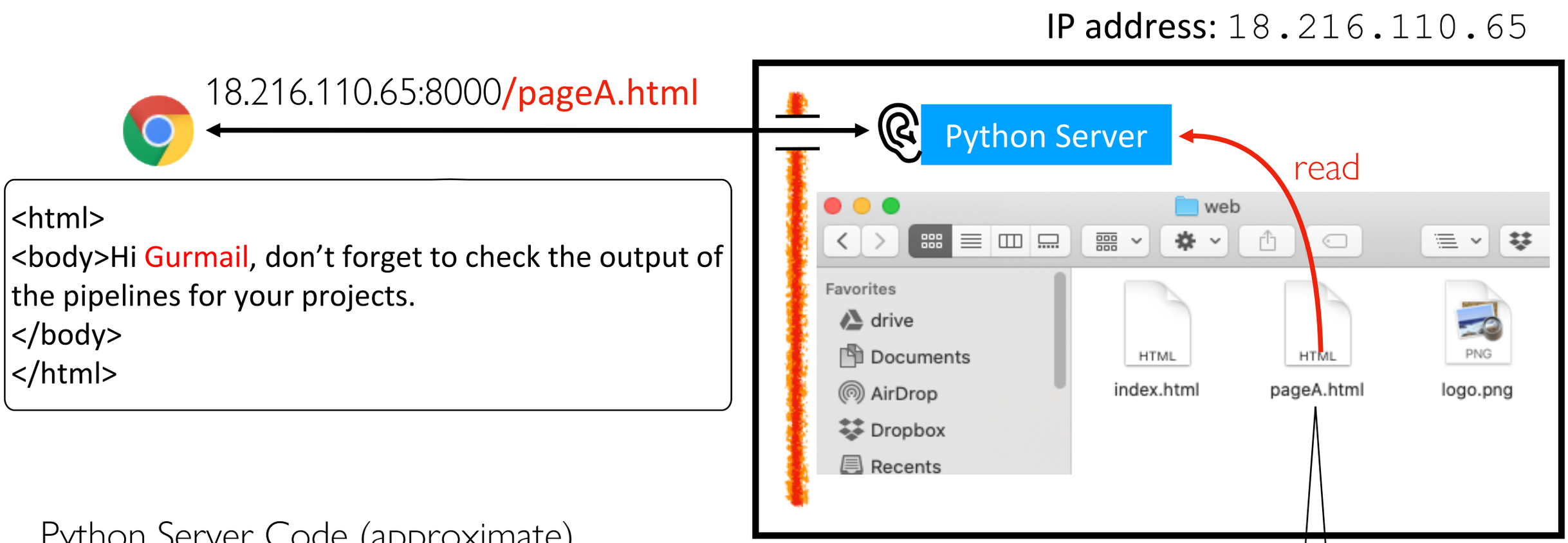
```
def get_page(resource):
    if resource == "/ha.html":
        return "<b>Ha!</b>" * 100

    with open(resource, "rb") as f:
        return f.read()
```

ha.html is dynamic

others are static

Templating: Add Dynamic Content to File




```
<html>
<body>Hi Gurmail, don’t forget to check the output of
the pipelines for your projects.
</body>
</html>
```

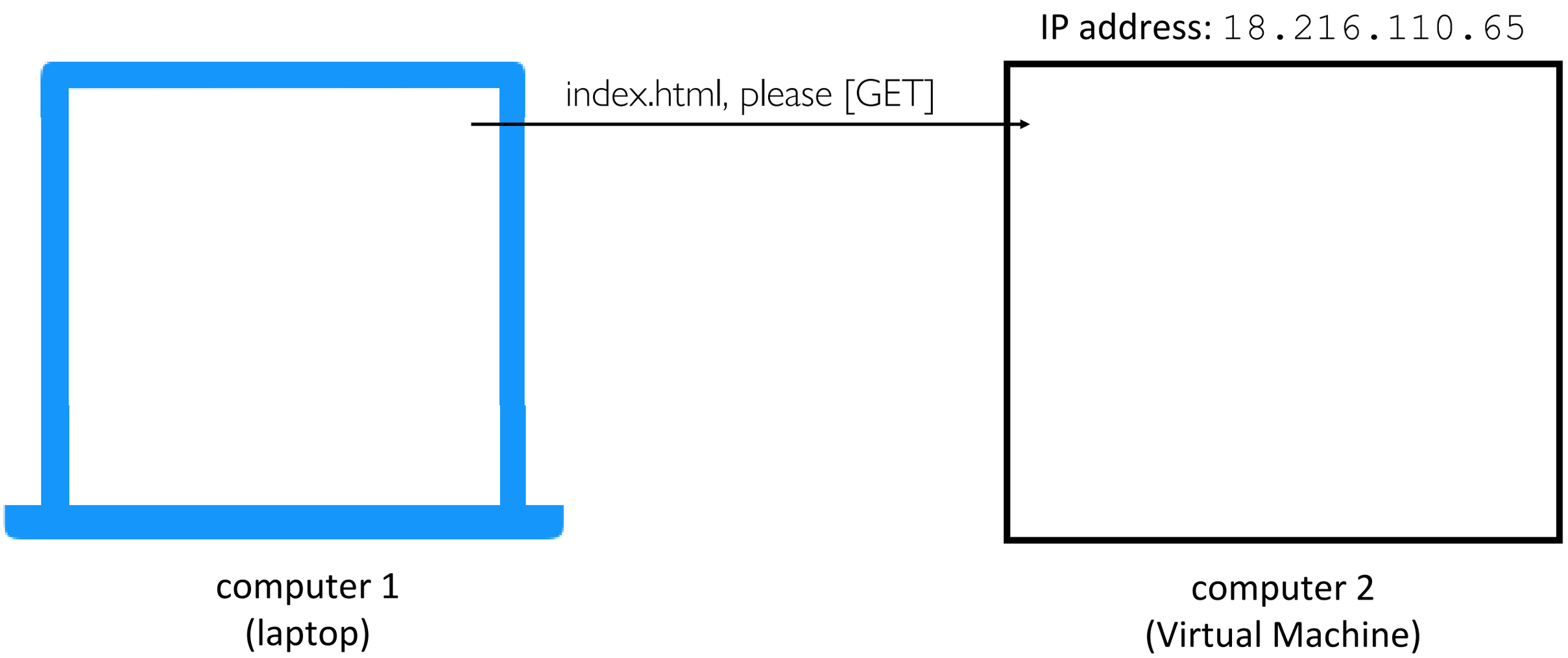
Python Server Code (approximate)

```
def get_page(resource):
    with open(resource, "rb") as f:
        s = f.read()
        if resource = "/pageA.html":
            s = s.format(date.today())
        return s
```

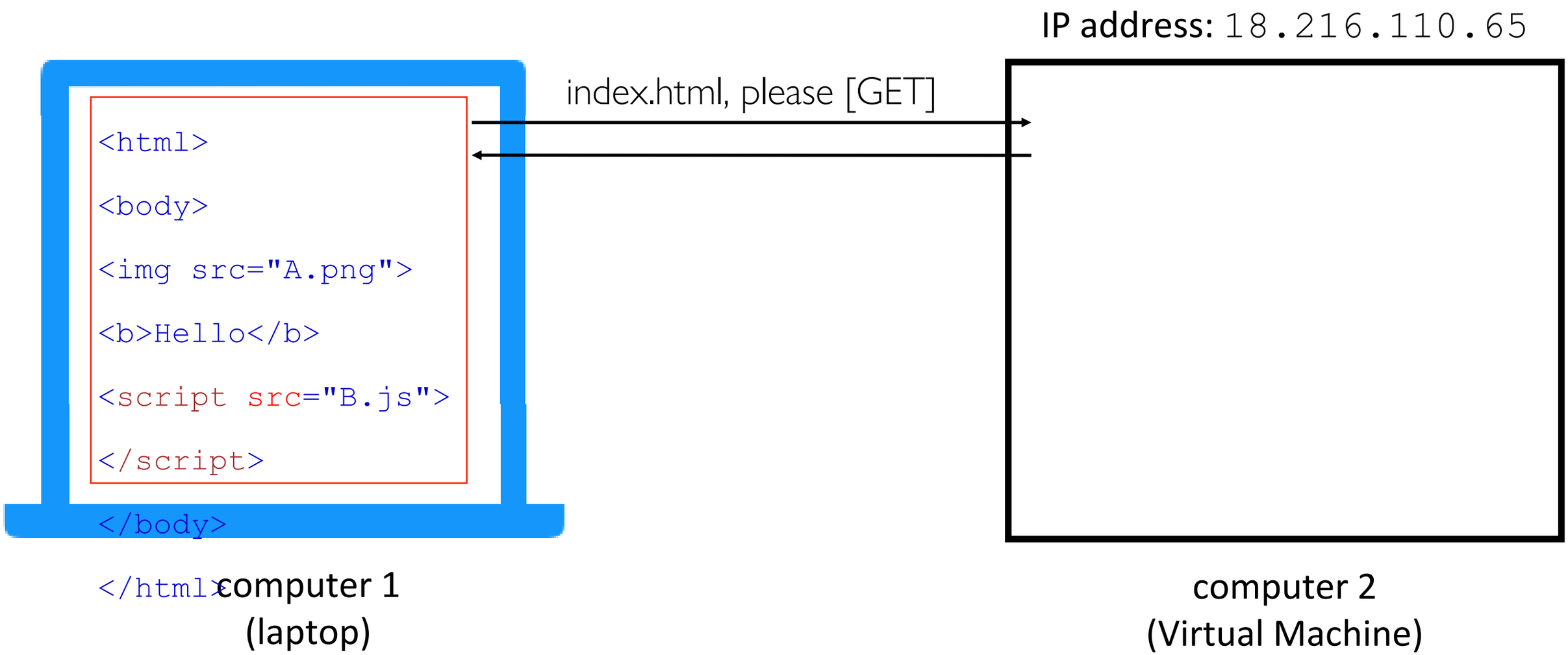
```
<html>
<body>Hi {}, don’t forget to check the output of the
pipelines for your projects.
</body>
</html>
```

Multi-File Pages

Page Load, the Big Picture



Page Load, the Big Picture



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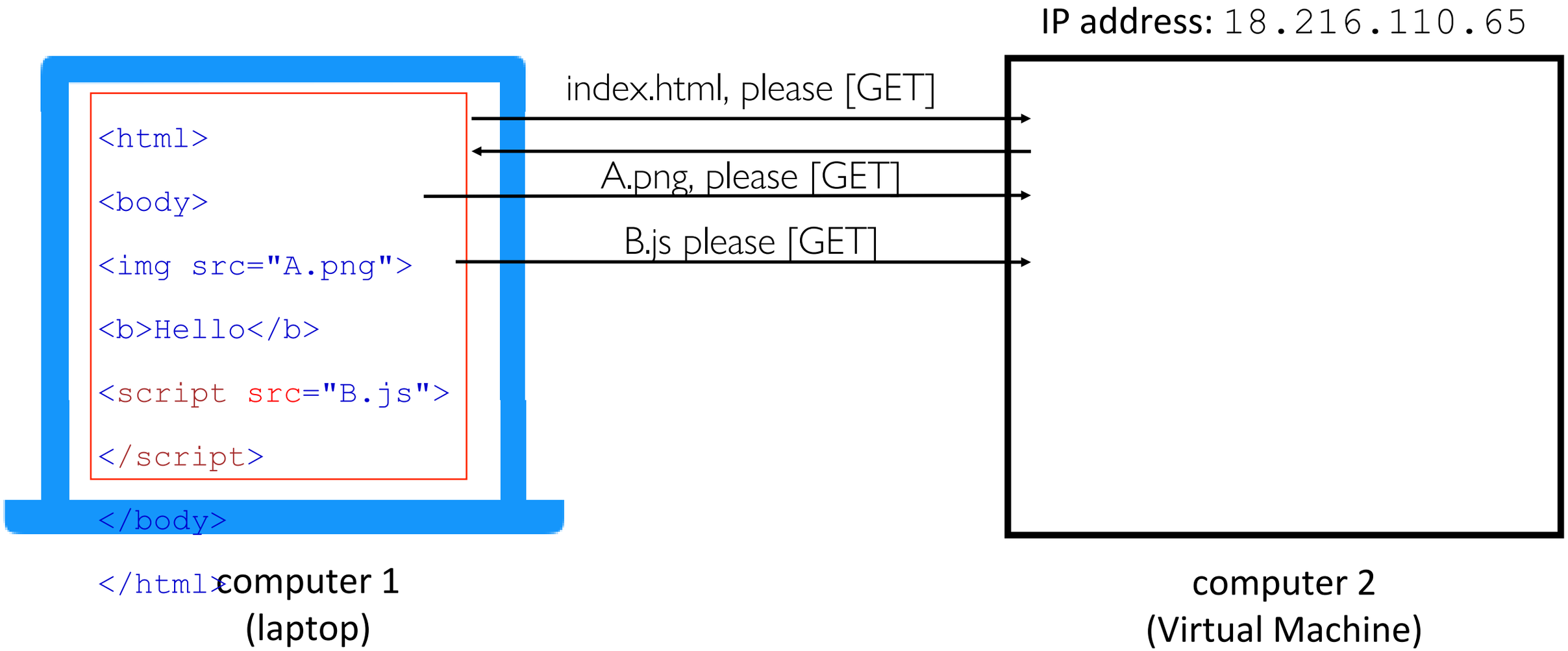
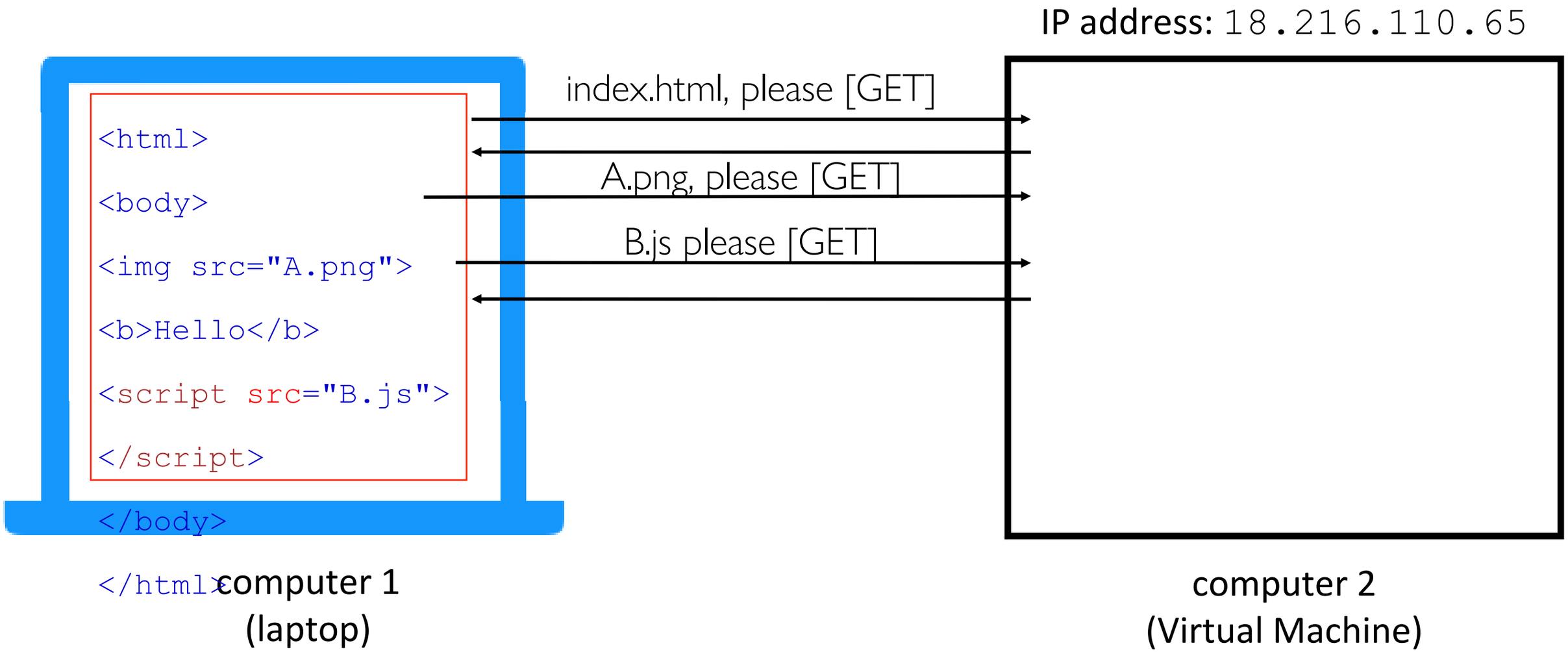


Page Load, the Big Picture



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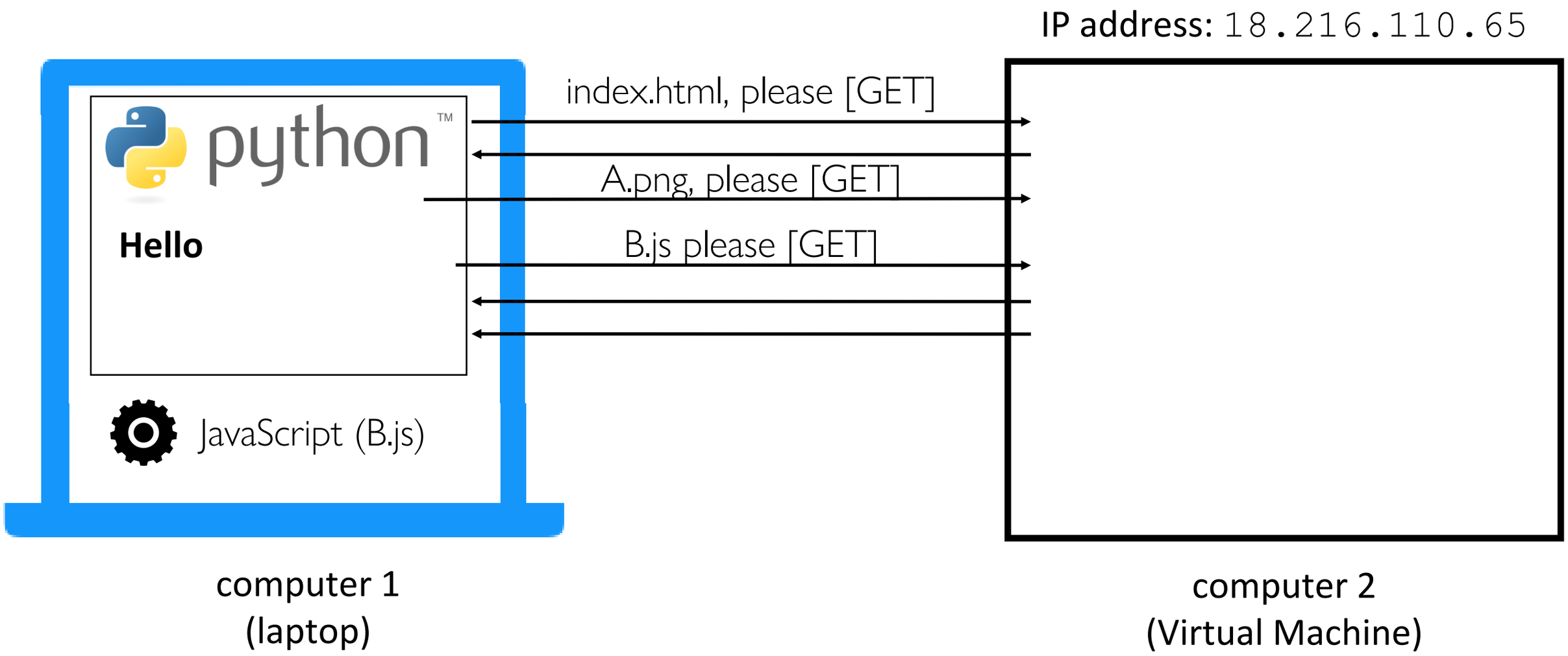
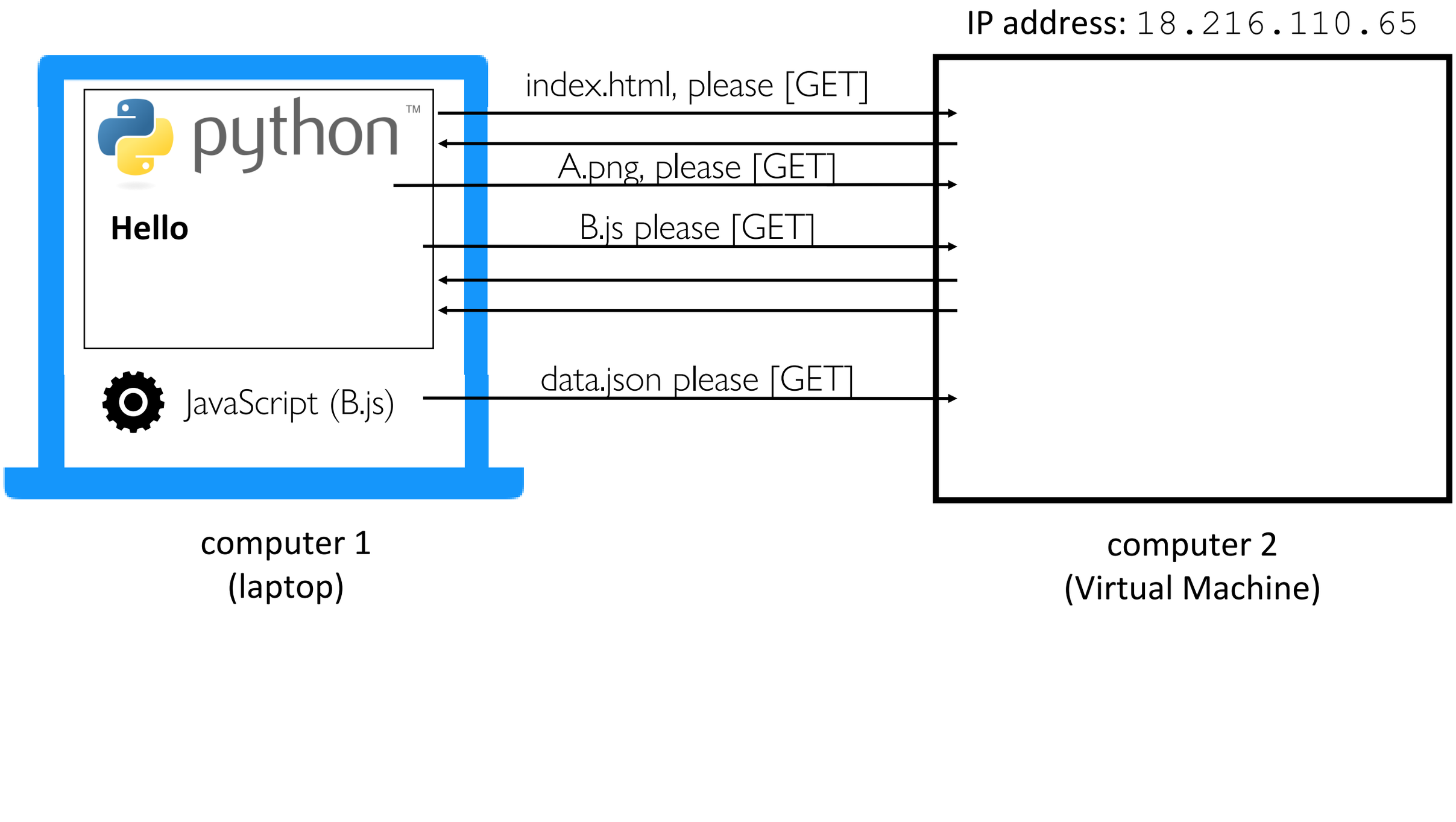


Page Load, the Big Picture



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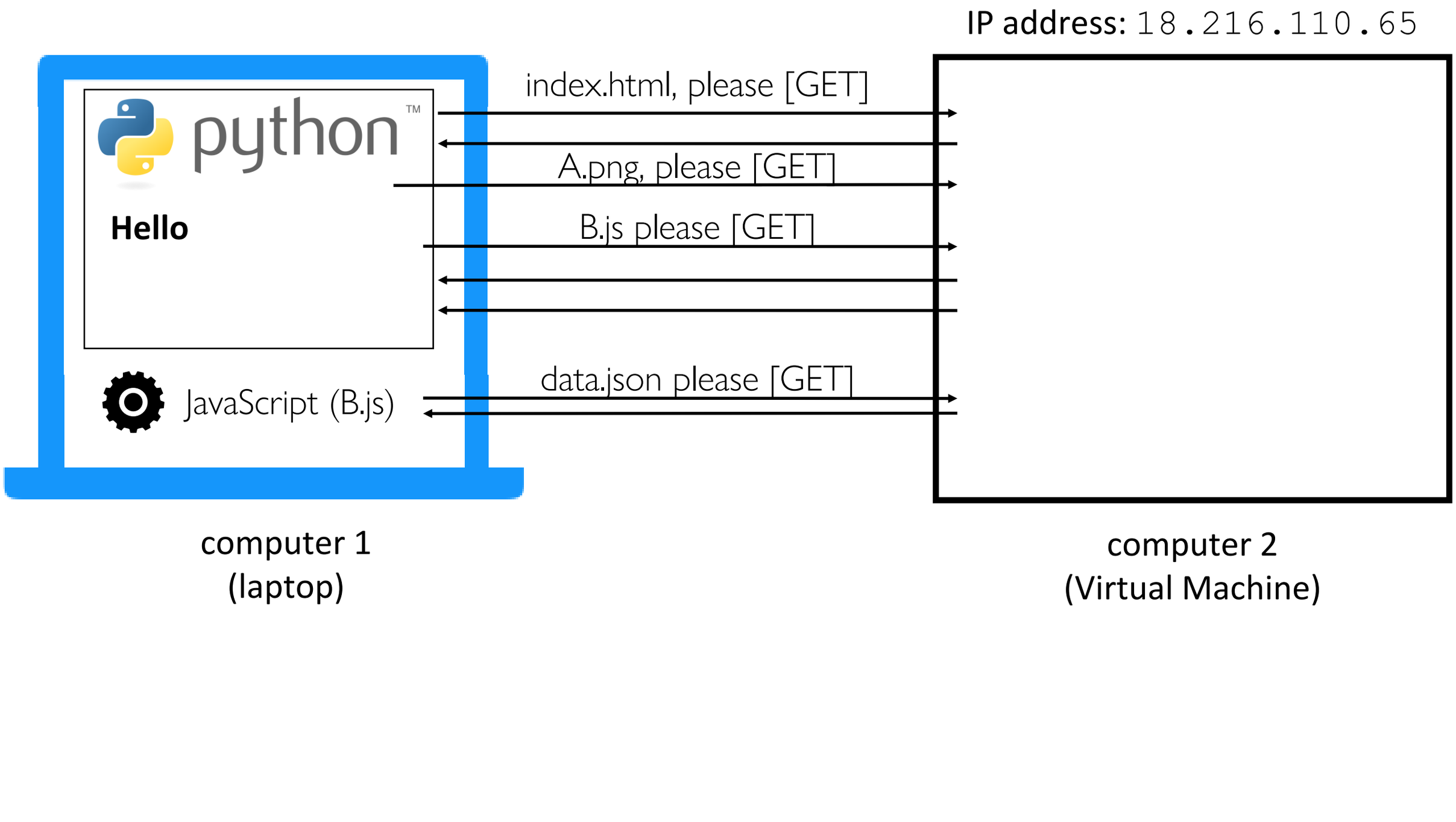
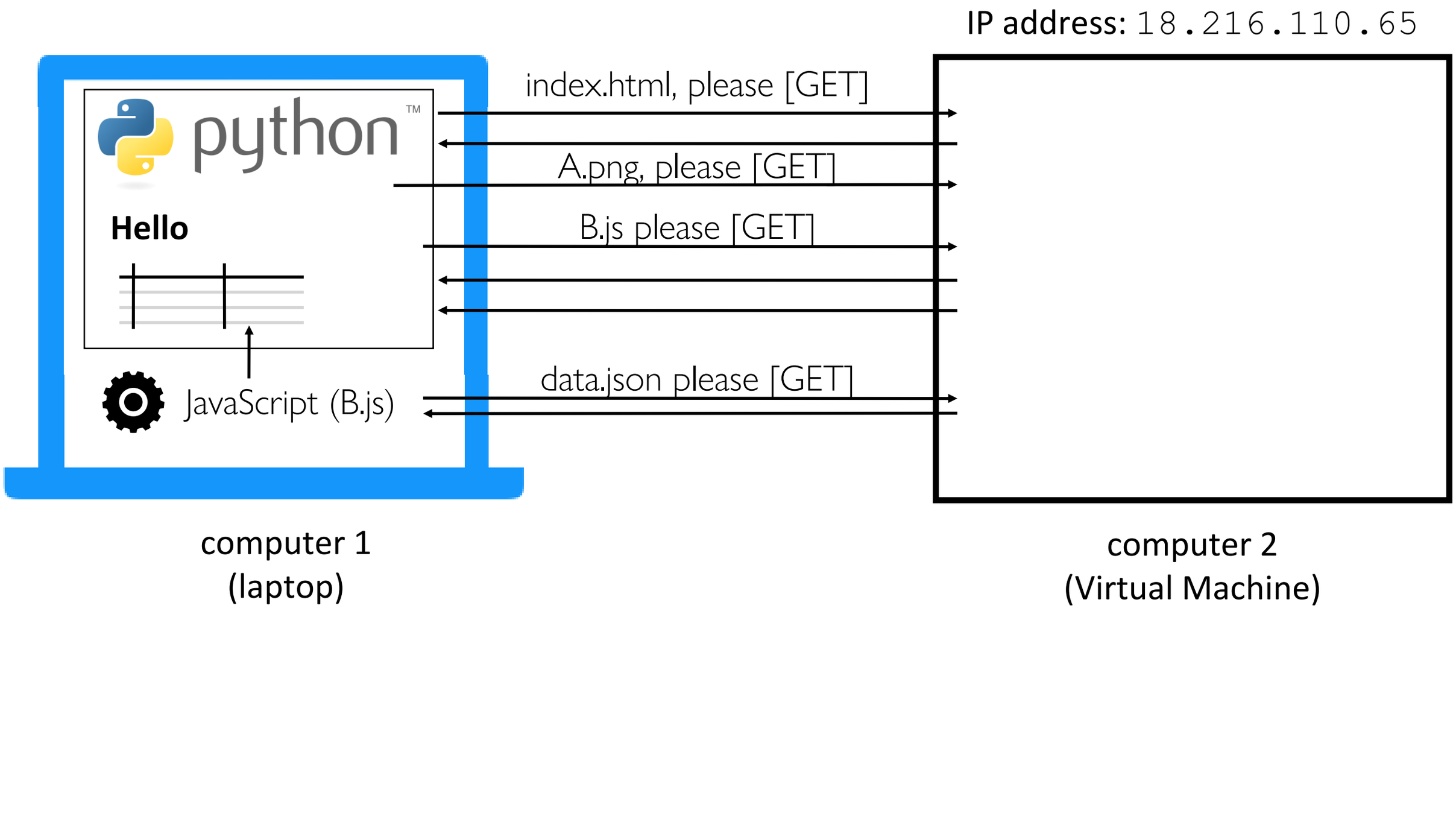


Page Load, the Big Picture



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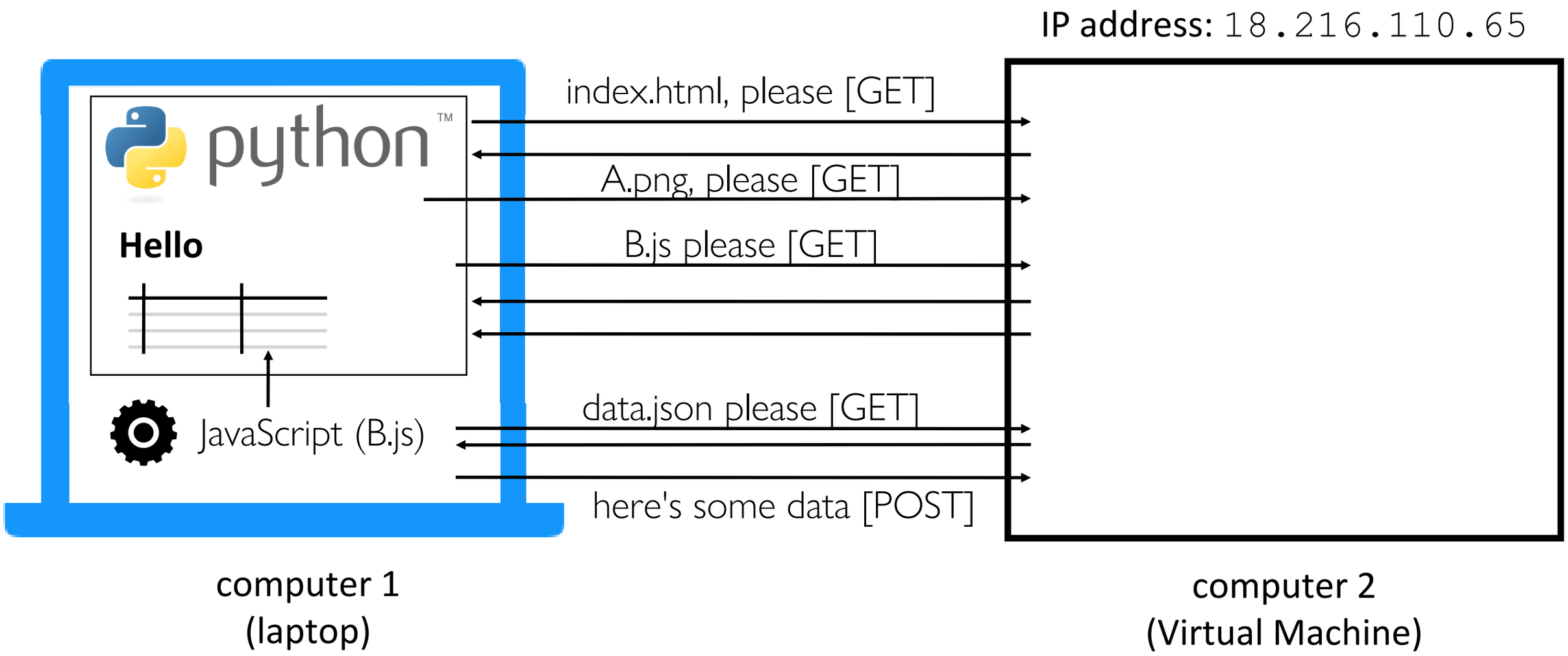


Building a dashboard or similar app will involve many routes/requests

Summary: Key Web Concepts

IP address: identifier for a computer (or network card on computer)

port number: identifier used to route to specific process on computer

firewall: software to block certain requests, often for certain ports

listening: process is ready to receive requests from an IP/port

DNS: service for converting domains to IP addresses

HTTPS: encrypted HTTP traffic so others can't watch traffic on WIFI, etc

static pages: pages that correspond to files on the server

dynamic pages: pages generated on-the-fly by some Python code

templating: insert dynamic content into certain places in a file

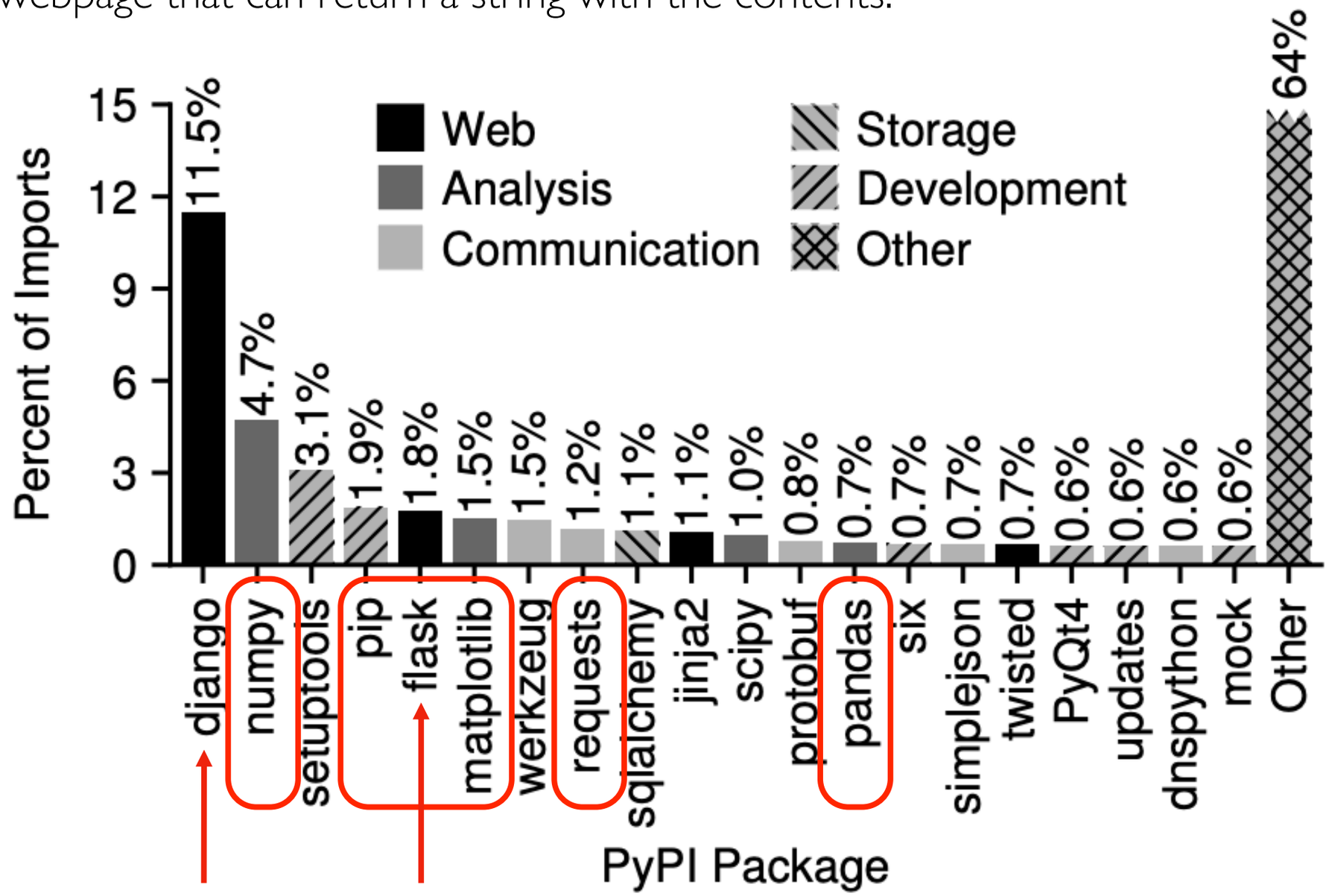
HTTP GET: request to download data

HTTP POST: request to upload data

Web Frameworks

Python Web Frameworks (and other packages)

Python web frameworks like Flask and Django make it easy to write functions for each webpage that can return a string with the contents.



we'll use **Flask**
for CS 320 because
it is simpler than **Django**

https://www.usenix.org/system/files/conference/atc18/atc18-oakes.pdf

Flask Example

Start from lecture snippets