

# CSCI 77800 – Ethics and Computer Science

Session II – 9/5/2024

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# Announcement: NSF Game Maker



- Taken from an NSF email: “The U.S. National Science Foundation Game Maker Awards is an exciting opportunity for students in grades K-12 to showcase their creativity, technical skills and passion for game design.”
- Webinar: Tuesday, September 10, 2024 - 2 P.M. EDT
- [https://us06web.zoom.us/webinar/register/WN\\_OaziBQZPQ0Oi24fLt11Wnw?utm\\_medium=email&utm\\_source=govdelivery#/registration](https://us06web.zoom.us/webinar/register/WN_OaziBQZPQ0Oi24fLt11Wnw?utm_medium=email&utm_source=govdelivery#/registration)

# Broadband, Access and Equity Event

- <https://www.amny.com/news/spectrum-schneps-media-present-broadband-access-equity/>
- “finding solutions to closing the technology gap and resolving digital inequities in neighborhoods across New York City.”
- September 24
- 9am – noon
- Guttman Community College, 50 West 40<sup>th</sup> Street.

# P0: What did we learn in the previous session?

- Jupyter Notebooks IDE
- Stakeholder.
- Vocabulary:
  - kernel.
  - Deepfake vs AI generated content.
  - interpreted vs. compiled vs. bytecode.
  - library.
  - virtual machine vs. sandbox (container/Docker container).
    - What does MyBinder build?
  - the above vs. virtual environment.
- Feel free to send me emails ([et3076@hunter.cuny.edu](mailto:et3076@hunter.cuny.edu)) asking for difficult concepts to be re-reviewed at the start of SYNC3.

# EthiCS Videos Justification: NYSED Content Test Standards

- “COMPETENCY 0001—IMPACTS OF COMPUTING”
  - “demonstrates knowledge of applications of computing technologies in the classroom, home, community, and broader society”
  - “demonstrates understanding of the impacts of computing technologies on individuals and society (e.g., in business, education, entertainment, government, or health care) and of how technologies influence and are influenced by society and culture”
  - “evaluates the impact of computing technologies on equity, access, and influence in a global society and the personal and societal trade-offs associated with computing technologies”

**Source:** [https://www.nystce.nesinc.com/content/docs/NY194\\_OBJ\\_FINAL.pdf](https://www.nystce.nesinc.com/content/docs/NY194_OBJ_FINAL.pdf)

**Case Study:**

How can we block ads?

# Today's Case Study Justification:

## NYSED Content Test Standards

- “COMPETENCY 0003—NETWORKS, THE INTERNET, AND SYSTEM DESIGN”
  - “demonstrates knowledge of the components and topologies of networks that contribute to the scalability and reliability of a network”
  - “demonstrates knowledge of the protocols for connecting devices and transmitting data over the Internet”

# Peer-to-Peer Discussion 0

[5 minutes]

**Step 1:** Without us having had the technical discussion, how would you design an ad blocker? (Best guess!)

**Part 2:** Examine how the world is a series of interconnected networks: **Visit:** Global Internet Map 2021 <https://global-internet-map-2021.telegeography.com/>.

**Part 3 (overtime):** Examine the submarine cable connections between landmasses: <https://submarine-cable-map-2024.telegeography.com/>



# Case Study: How can we block ads?

- Goals:
  - To learn about the simplest way these work.
  - To try out an essential component of ad blocking using a Python program.
- Journey to get there:
  - How does the Internet work?
  - What does DNS do for IP addresses and names?
  - More on using libraries (library dangers)
  - More on using virtual environments

# The “Internet” is a series of networks

- “The Internet is made up of roughly 74,000 independently operated but interconnected networks, per the White House.”
- **Source:** <https://www.govtech.com/security/white-house-releases-plans-for-safer-internet-routing>

# IP Networks

## ~~Adblocker~~(paused)

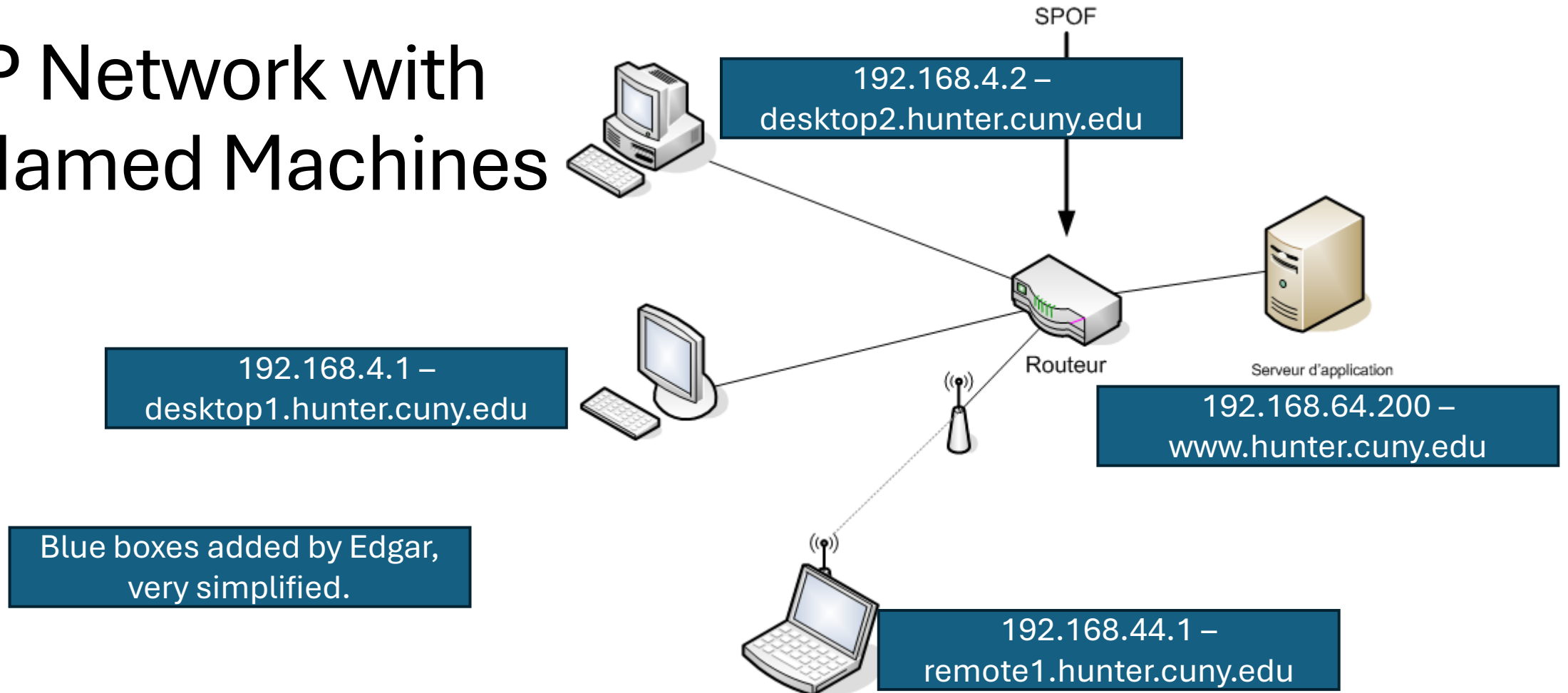
Aside #1: IP Networks

What data structure am I mimicking?

# IP Networks

- **Google's IP addresses**
  - One block: 64.233.160.0 – 64.233.191.255
  - **Source:** <https://www.lifewire.com/what-is-the-ip-address-of-google-818153>
- **CUNY's IP addresses**
  - One block: 146.111.120.0 - 146.111.120.255
  - **Source:** <https://db-ip.com/all/146.111.120>

# IP Network with Named Machines



- **Original Image:** <https://simple.wikipedia.org/wiki/Router#/media/File:SPOF.png>
- **Author:** Charles Féval
- **License:** <https://creativecommons.org/licenses/by-sa/3.0/>
- **Attribution:** "By Charles Féval - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=1290180>"

# Enter: the DNS

- How do we translate from names to numbers and vice versa?
- DNS server = domain name system server.
- A records                    (“address”                    – resolve: name to number)
- PTR records                (“pointer”                    – reverse lookup: num to name)
- MX records                (“mail exchange” – where to send email)
- Let’s run a Python program to demonstrate.
- **python3 dnslookup.py**

Virtual environments  
~~IP Networks (paused)~~  
~~Adblocker (paused)~~

Aside #2: Virtual environments

# Setting up a VENV/ VirtualEnv/ Virtual Environment

- **python3 dnslookup.py**
  - Throws error that dns.resolver library is missing.
- **apt list | grep dnspython**
  - Shows that the library exists and could be installed system-wide.
  - Here's what we need: "python3-dnspython/noble,noble 2.6.1-1ubuntu1 all"
  - Do you have root administrative access to the server? Do you want everyone to have access to this? Could the library conflict with others?
- Let's use pip instead.
  - Find it in PyPi: <https://pypi.org/>.
- **pip install dnspython**
  - You can use pip (the Python package manager) as a non-root user.
  - However, pip complains (on some machines) that it's better to use a VENV.



# Setting up a VENV/ VirtualEnv/ Virtual Environment (part 2)

- Read more on Python Virtual Environments:  
<https://docs.python.org/3/library/venv.html>
- Conflicting libraries can co-exist. Users can manage the versions of their own libraries.
- Are there any other library problems?

# Library problems

~~Virtual environments (paused)~~

~~IP Networks (paused)~~

~~Adblocker (paused)~~

Aside #3: Library problems

# Aside #3 - Libraries

## The Library that “Broke the Internet”

- kik was a formatting package; author also wrote a library that left padded numbers.
- It was removed in a trademark dispute.
- Used by a number of packages including React.
- Read more: “How one programmer broke the internet by deleting a tiny piece of code” <https://qz.com/646467/how-one-programmer-broke-the-internet-by-deleting-a-tiny-piece-of-code>.
- Another account: [https://en.wikipedia.org/wiki/Npm\\_left-pad\\_incident](https://en.wikipedia.org/wiki/Npm_left-pad_incident)

# Aside #3 - Libraries

## The OpenSSH (or XZ/liblzma) Library Debacle

- “Backdoored 'liblzma' contained an initialization routine that allowed it to inject back-door into the server application at the time when it is started and loaded into memory.”
- **Source:** <https://www.ssh.com/blog/a-recap-of-the-openssh-and-xz-liblzma-incident>
- “The attacker, using the Jia Tan name, appears to have spent several years slowly gaining the trust of other xz Utils developers and getting more control over the project,...”
- **Read more:** “Did One Guy Just Stop a Huge Cyberattack?” NYTimes. (April 3, 2024).  
<https://www.nytimes.com/2024/04/03/technology/prevent-cyberattack-linux.html>

~~Library problems (terminated)~~

Virtual environments

~~IP Networks (paused)~~

~~Adblocker (paused)~~

# Let's Build Our Virtual Environment

- **python3 -m venv dns**
  - Makes the virtual environment. (Not virtual machine. Not sandbox.)
  - Python help: `python -h`: “-m mod : run library module as a script (terminates option list)”
- **ls dns ; ls dns/bin**
  - Can look inside.
- **source dns/bin/activate**
  - Activates the environment.
- **python -m pip install dnspython**
  - Installs – but in the VENV.
- **python3 dnslookup3.py**
  - It runs!
- Read more on Python Virtual Environments:  
<https://docs.python.org/3/library/venv.html>

# Jupyter: Makes this easy.

```
-----
ModuleNotFoundError                                Traceback (most recent call last)
Cell In[1], line 6
      1 # CS778 -- 2024 FA -- E. Troudt
      2 # dnslookup.py: A simple DNS lookup program using the dnspython library
      3 #
      4 # If you would like to see more sample code: https://github.com/rthalley/dnspython/blob/main/examples/query_specific.py
----> 6 import dns.resolver
      9 # using Google's primary DNS.
     10 # Why do we get multiple IP addresses for some domains? (e.g., www.cnn.edu)
     11 # Why are those IP addresses in a different order if you query twice?
     12 dmn = input("What domain? ")

ModuleNotFoundError: No module named 'dns'
```

```
[2]: ! pip install dnspython
```

```
Defaulting to user installation because normal site-packages is not writeable
Collecting dnspython
  Downloading dnspython-2.6.1-py3-none-any.whl.metadata (5.8 kB)
  Downloading dnspython-2.6.1-py3-none-any.whl (307 kB)
Installing collected packages: dnspython
Successfully installed dnspython-2.6.1
```

~~Library problems (terminated)~~

~~Virtual environments (terminated)~~

IP Networks

~~Adblocker (paused)~~



# Networks

- **Google**
- One block: 64.233.160.0 – 64.233.191.255
- **Source:** <https://www.lifewire.com/what-is-the-ip-address-of-google-818153>
- **Google Public DNS**
- Servers: 8.8.8.8 and 8.8.4.4
- **Source:** <https://www.lifewire.com/what-is-the-ip-address-of-google-818153>

# Pair-wise Exercise 1

- Download and run **DNSPython.ipynb** from Blackboard → “**Weekly Notes**” → “**Week 2**”.
- Every student should run the code to ensure that your development environment is ready.
- Do **Pair-wise Exercise 1** noted at the top of the file. Screen share and constantly discuss; please don’t do this individually in silence.
- Upon return:
  - How can we block ads?
  - Report out.
  - Edgar explains second code in detail, including library aliasing.

# Pair-wise Exercise 2

- Do **Pair-wise Exercise 2** located in the middle of the Jupyter notebook.
- Upon return:
  - Edgar explains the **#!/usr/bin/env python3** for direct execution.
  - Edgar explains why **! git clone** [https://github.com/rthalley/dnspython/blob/main/examples/reverse\\_name.py](https://github.com/rthalley/dnspython/blob/main/examples/reverse_name.py) works on command line but not necessarily in his Jupyter.
  - Try the **%load** directive instead.
    - **%load** [https://github.com/rthalley/dnspython/blob/main/examples/reverse\\_name.py](https://github.com/rthalley/dnspython/blob/main/examples/reverse_name.py)
- Article on importing code: <https://saturncloud.io/blog/how-to-import-code-into-jupyter-notebook-online/>

# Overtime Exercises

- Return to Week 1 notes.
- Section P6 – Python Practice (Overtime)

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