CSE 127 Week 8 Discussion

Ariana Mirian

Zoom

Props to Deian Stefan for Slides

This is being recorded

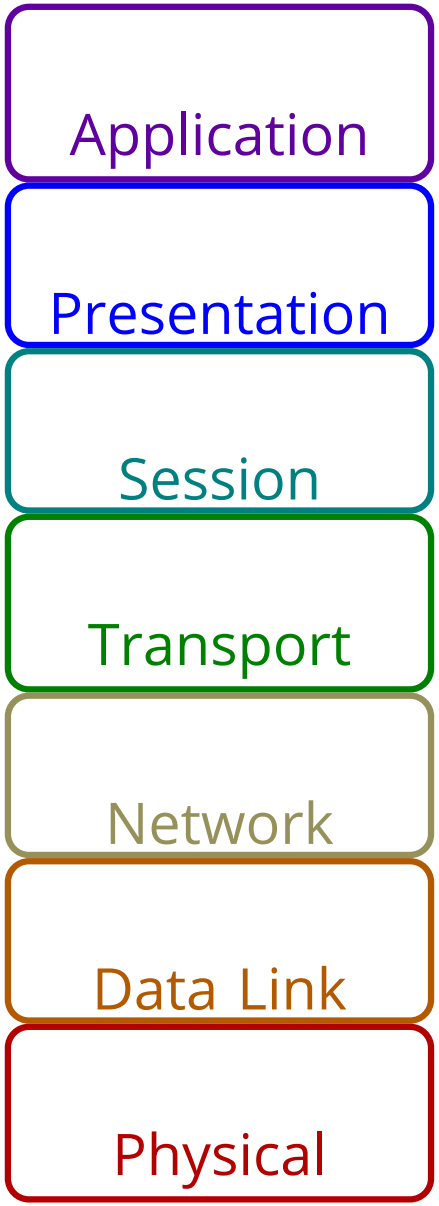
PA4 due tomorrow!

Overview of Today

- Overview of last two lectures
  - Some new information
- Brief overview of PA5
  - Tools that might be helpful during the PA
- Open office hours (if time)

OSI Layers

(Open Systems Interconnection)



- End user layer
- HTTP, FTP, Skype, SSH, SMTP, DNS

- Syntax, byte order, compression, encryption
- SSL, SSH, MPEG, JPEG

- Connection establishment and maintenance
- APIs, sockets

- End-to-end connections between processes
- TCP, UDP

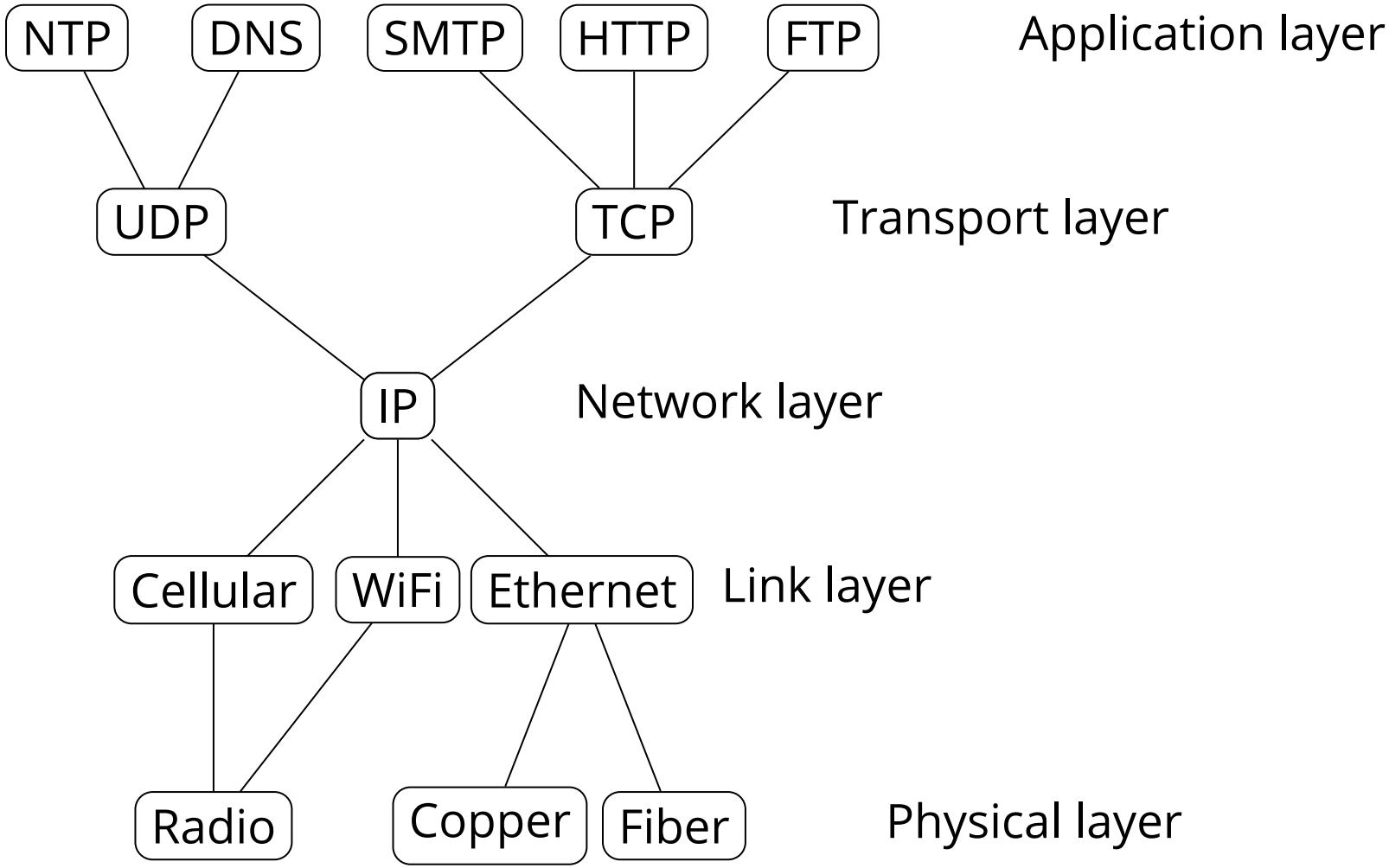
- Addressing, routing between nodes
- IP

- Link management, frames
- Ethernet, WiFi

- Physical wires
- Photons, RF modulation

Basic Internet Archictecture “Hourglass”

Narrow waist = interoperability



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   B. Broadcasts DHCPDISCOVER to 255.255.255.255 with its MAC address

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   C. DHCP server responds with config: lease on host IP address, gateway IP address, DNS server information

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B. Your laptop encapsulates each IP packet in an Ethernet frame addressed to the local router

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B. Your laptop encapsulates each IP packet in a WIFI Ethernet frame addressed to the local router
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D. Each hop re-encodes the link layer for its own network.

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    A. It learned the IP address of a DNS server from the router or was already hardcoded in (8.8.8.8)

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    D. This address is cached, along with the authorities for the hierarchy in the hostname

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    B. The local router has a routing table that contains IP prefixes that it matches against the IP address that tells it what address to forward the packets to
    C. The packet passes through a series of Autonomous Systems (AS)
    D. E.g. sbcglobal.net -> att.net -> leve3.net -> cenic.net -> ucsd.edu

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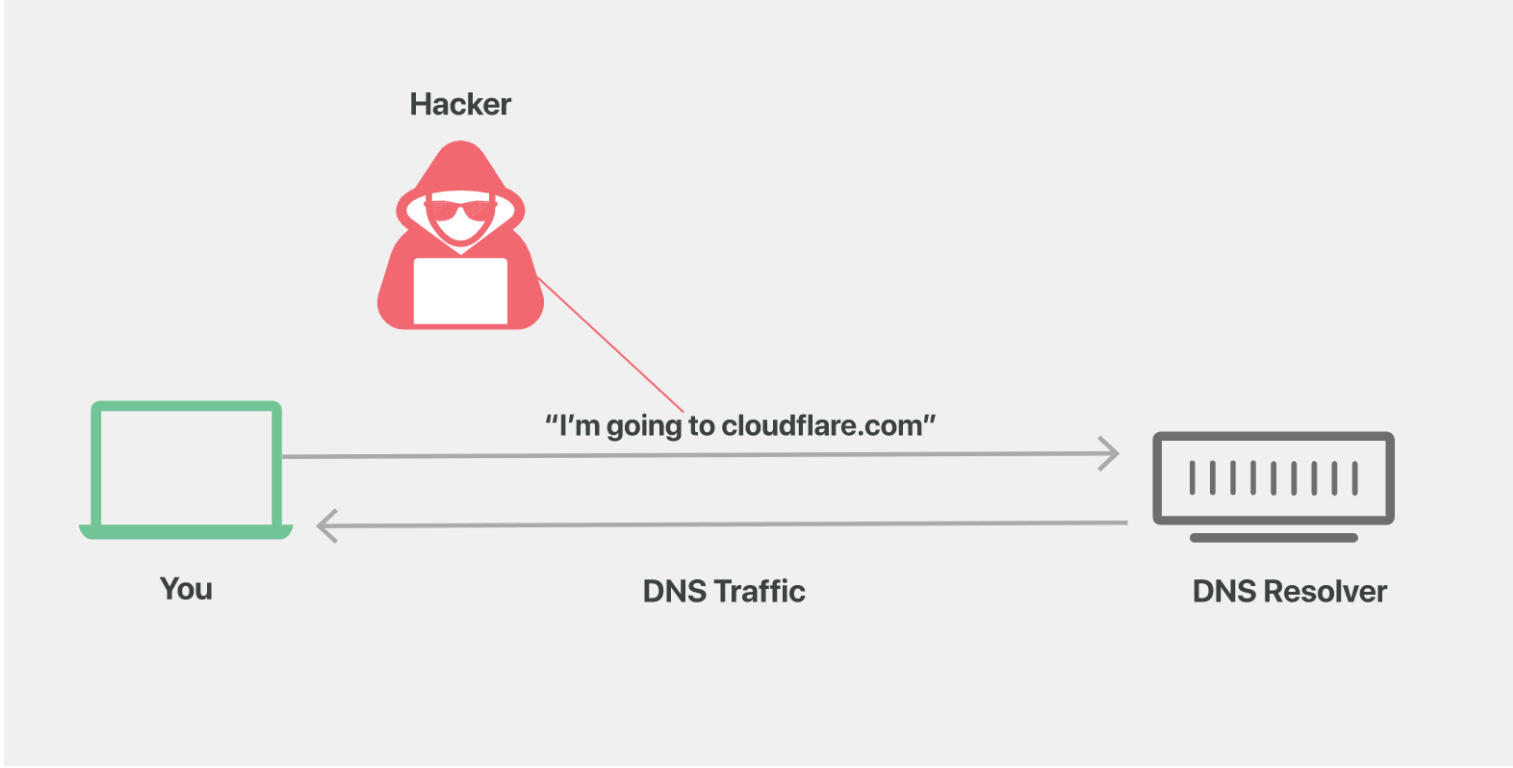
5. Your laptop sends a HTTP GET request inside the TCP connection
6. Based on the HTTP response, your laptop performs a new DNS lookup, TCP handshake, and HTTP GET for every resource in the HTML as it renders

Network attacks overview

- DNS Cache poisoning



https://www.cloudflare.com/learning/dns/dns-over-tls/

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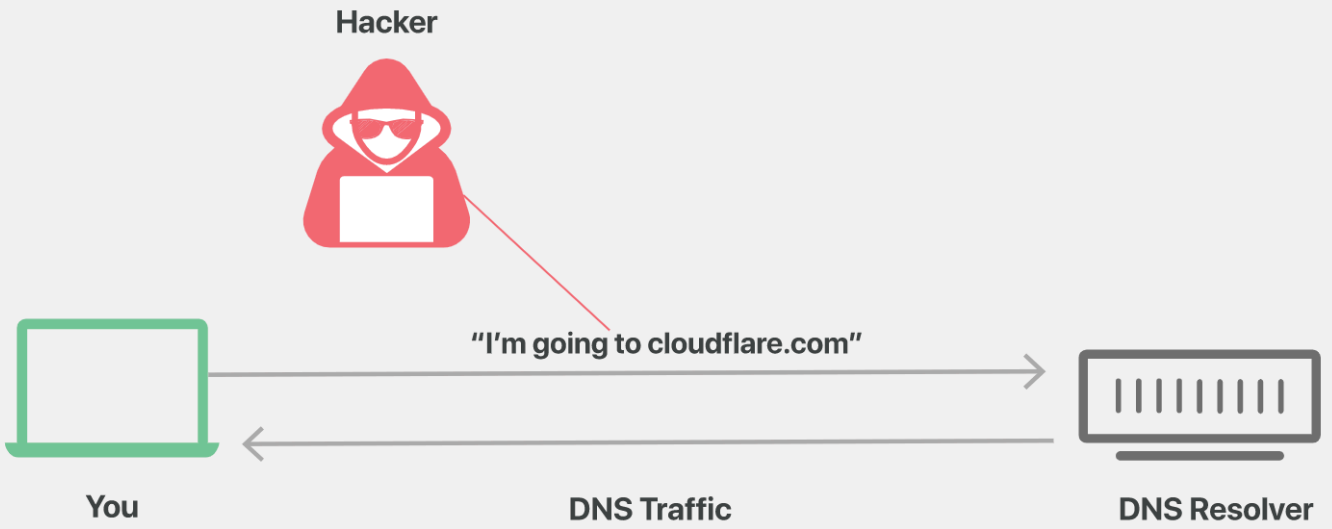
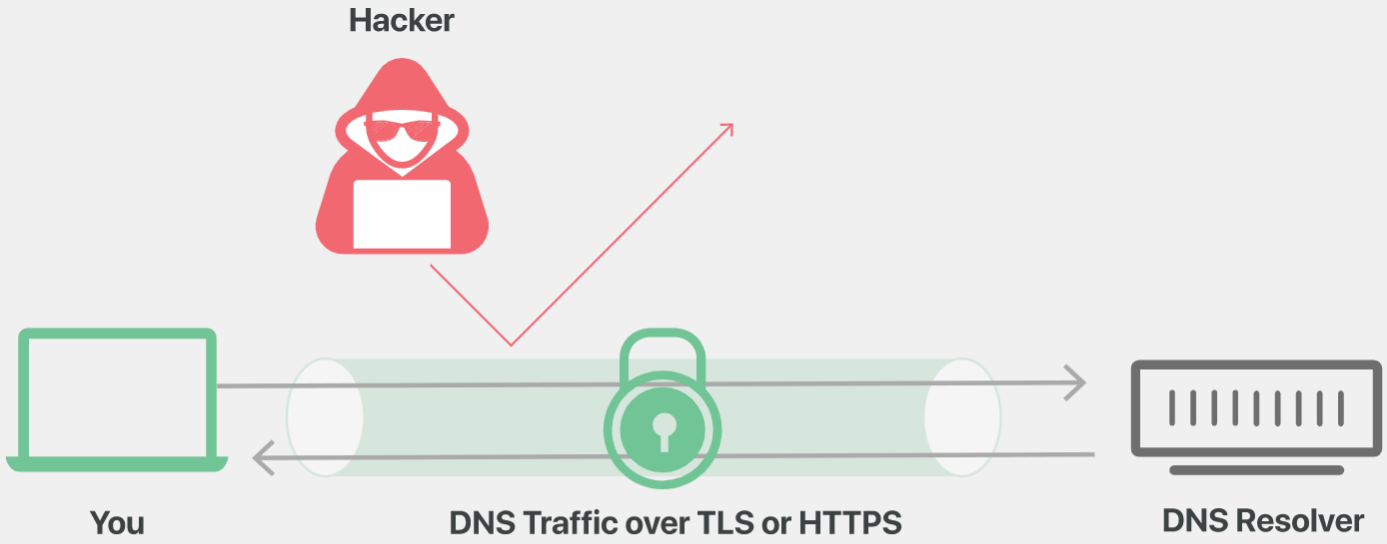
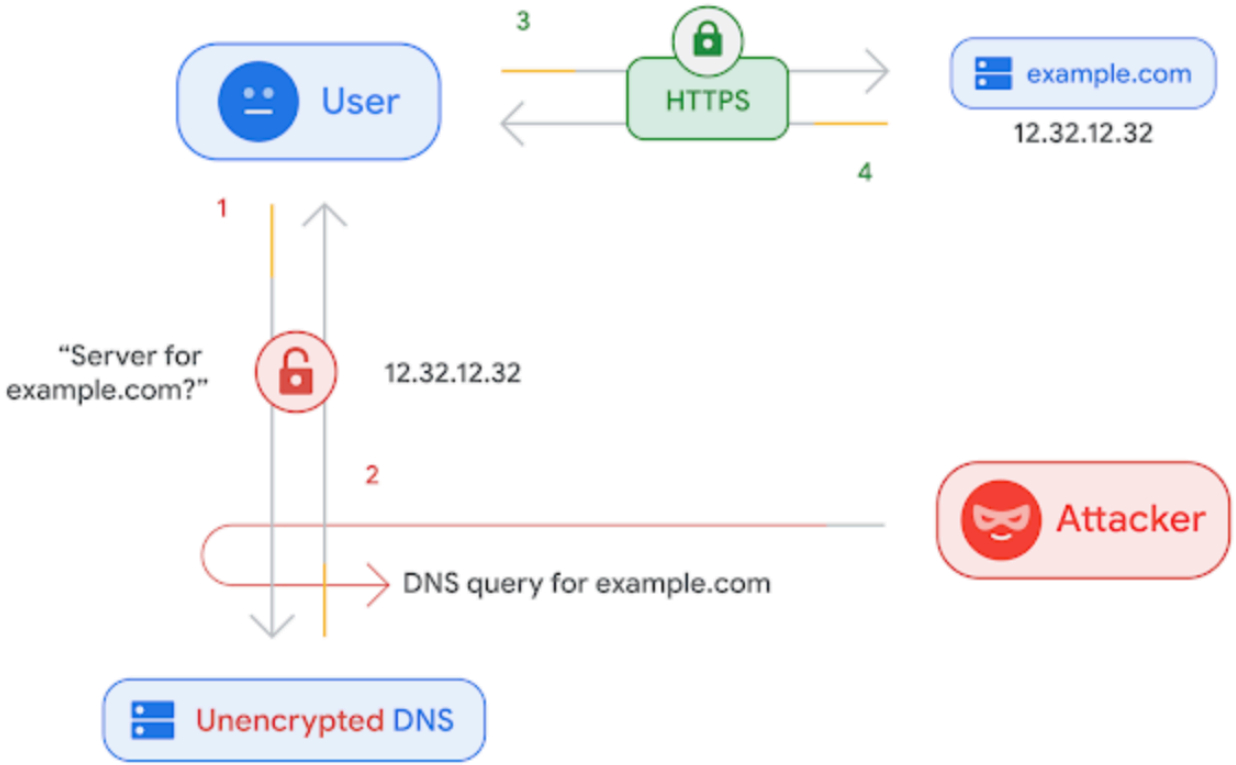




DNS over TLS and DNS over HTTPS

- DNS over TLS – uses TLS over UDP to protect DNS queries
  - Port 853
- DNS over HTTPS – uses HTTPS protocol/port to transfer DNS queries
  - Port 443
- Why two different solutions? Aren’t they the same?
  - Two different protocols/groups of people writing them
  - Pros and Cons of each

https://blog.chromium.org/2020/05/a-safer-and-more-private-browsing-DoH.html



With unencrypted DNS, an attacker connected to the same network can observe other users' browsing habits.

Network attacks overview

- DNS Cache poisoning
- Denial of Service
  - Resource consumption of service
  - TCP handshakes are expensive
- Network perimeter defenses
  - Hey you! Get off my firewall!

PA5 Overview!

PA5 overview

- Planned to be released Thursday or Friday, 2 weeks to finish it (hard deadline of June 11th because we need to turn in grades)
- Scavenger hunt! You need to find Stefan's "password"
  - Not his actual password…
- We'll send you an email with a tar file
  - From there, need to figure out how to get the password
  - Scavenger hunt so please be cautious of spoilers…come to office hours or utilize private posts on Piazza

Overview of tools you may need

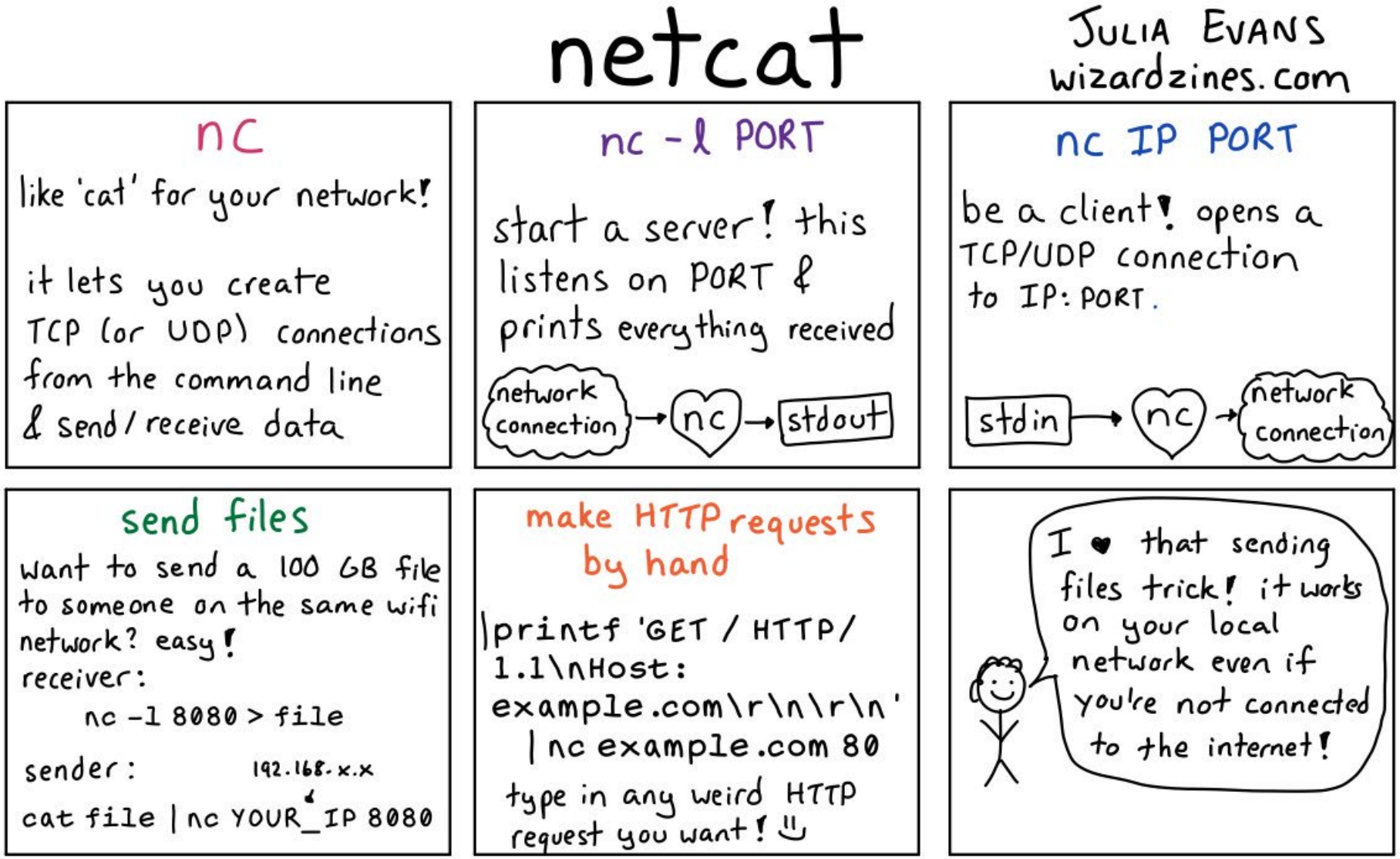
- nc
- nmap
- ssh
- tcpdump
- wget

Overview of tools you may need

- Nc – allows you to make connections locally
- Nmap – scan ports/IPs (locally and externally)
- Ssh – connect to servers
- Tcpdump – view traffic on machine
- Wget – download of files from internet

- All of these have “man” pages!

NetCat (shoutout to Julia Evans)



Happy hunting!