

# Lecture 12: BitTorrent

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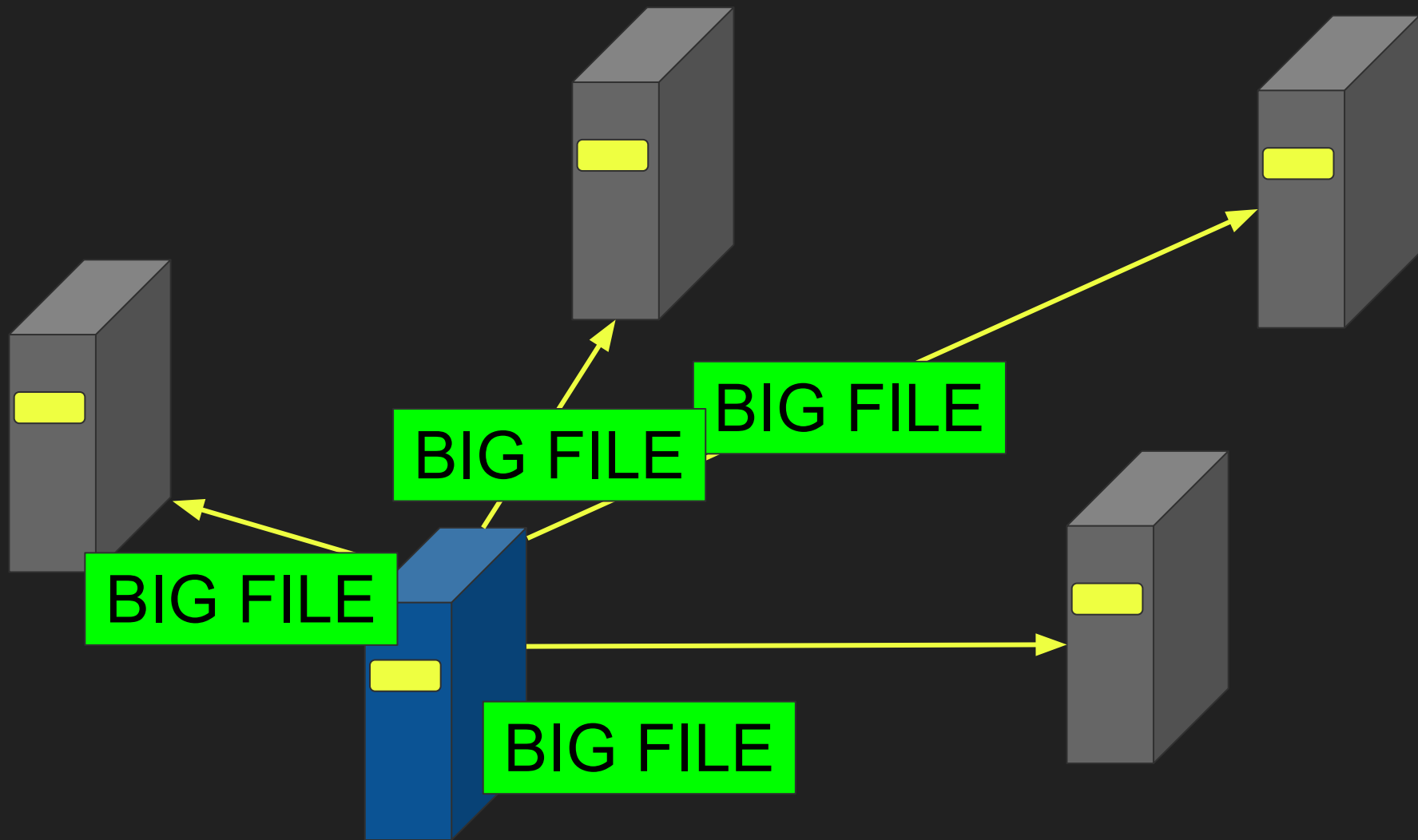
# BitTorrent – First Created in 2001 by Bram Cohen

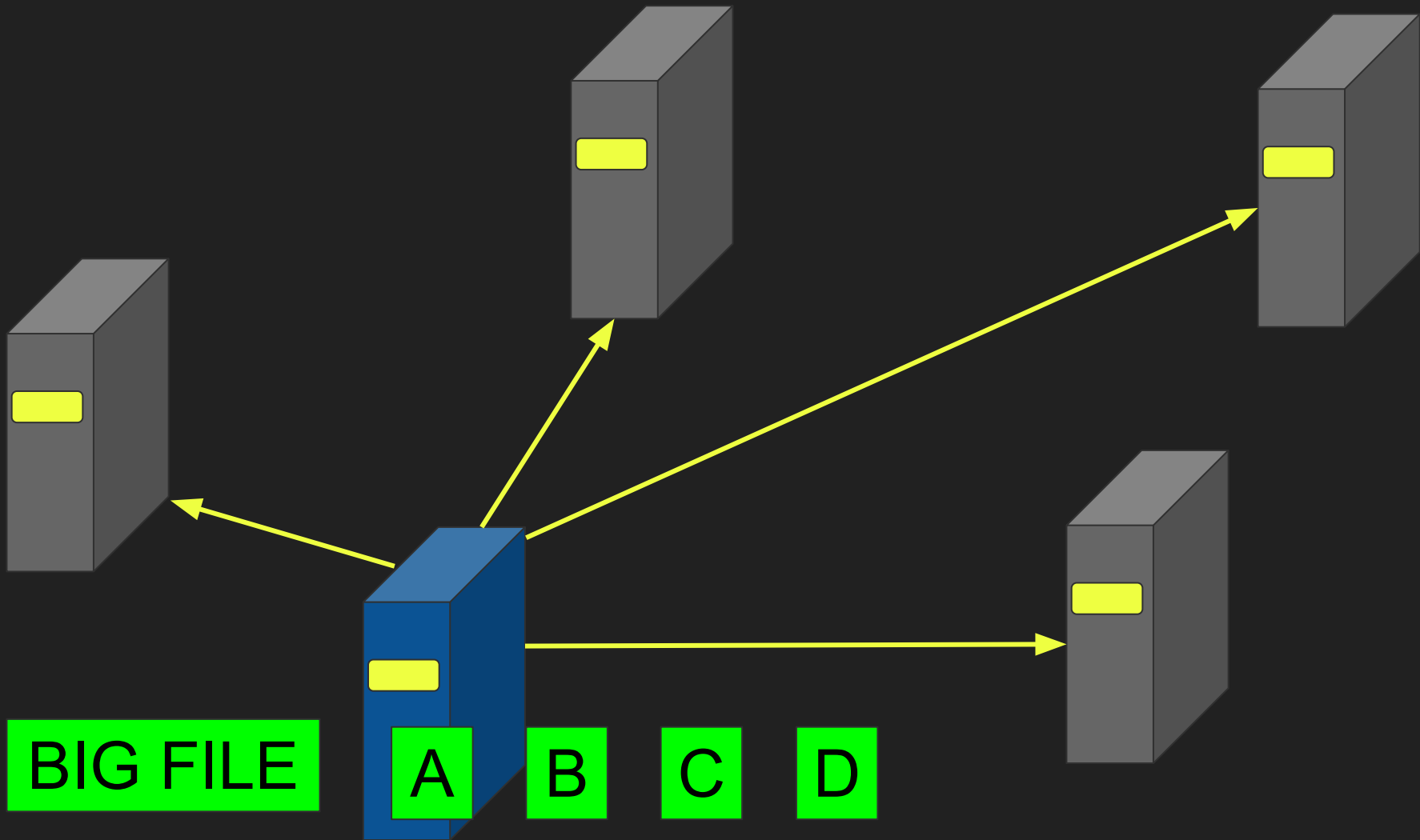
Originally Built on HTTP and FTP

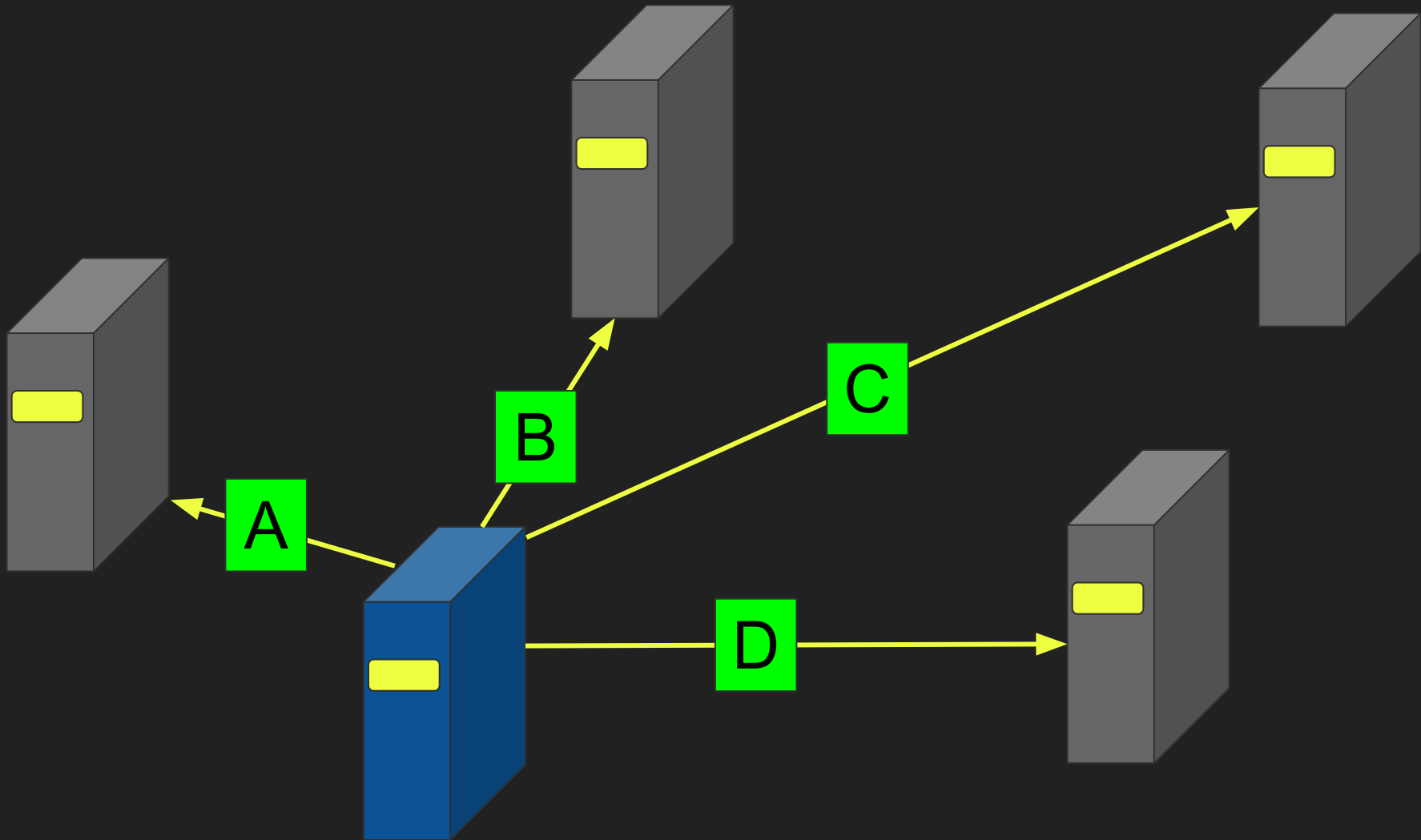
Extended to use HTTPS

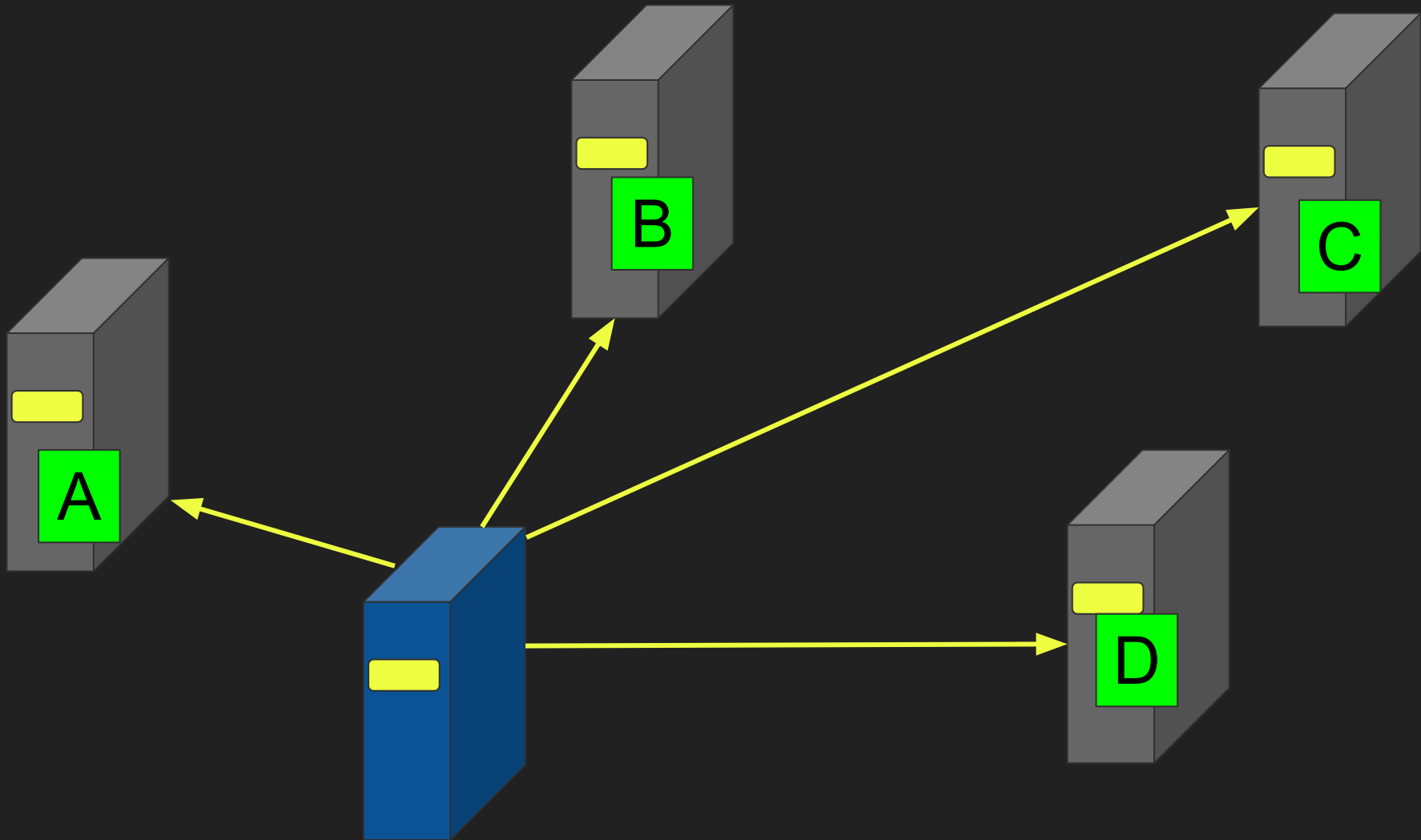
“Peers” on the network work together to split up large files.

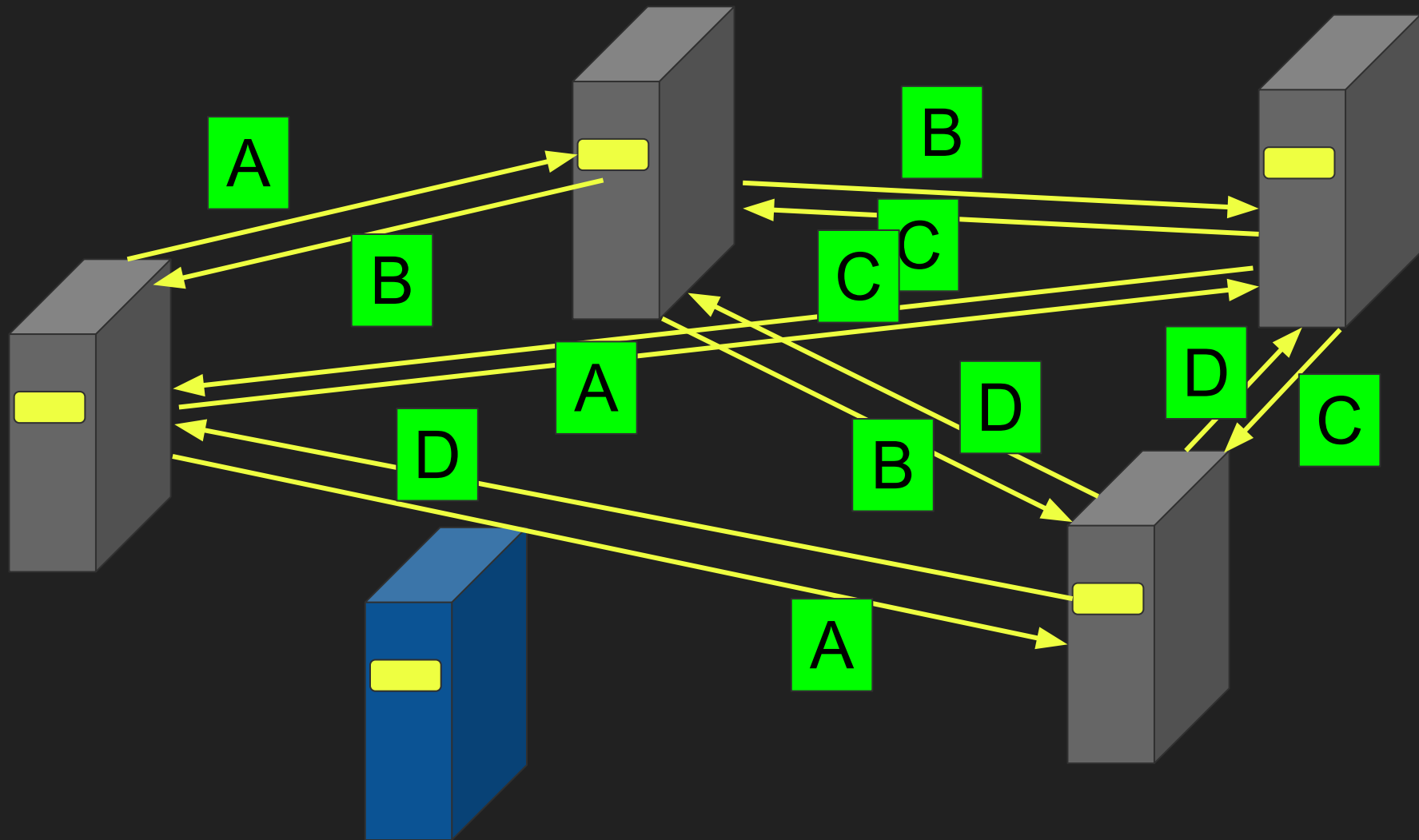
Clients can request all the pieces at once from the nearest peers, more efficiently uses network











# Networking Benefits of Bittorrent

Original uploader or “seeder” needs less upload bandwidth

Downloaders get their content faster

Multiple seeders can seed the file. Popular files are even faster.

Data sharing costs are shared democratically



# Networking Disadvantages of BitTorrent

It is just extra work for small, simple files

You need a client program to help you (not all that different from browsers for HTTP)

You can become involved in criminal conspiracies

You can't change a torrented file to correct errors. It has to be replaced

How do you find a list of seeders to download something?

# Torrent MetaInfo Files .torrent

```
{  
  'announce': 'http://bttracker.debian.org:6969/announce',  
  'info':  
  {  
    'length': 678301696,  
    'name': 'debian-503-amd64-CD-1.iso',  
    'piece length': 262144,  
    'pieces': <binary SHA1 hashes>  
  }  
}
```

# How .torrent files are distributed

## BitTorrent

BitTorrent is a peer-to-peer download network that sometimes enables higher download speeds and more reliable downloads of large files. You need a BitTorrent client on your computer to enable this download method.

Ubuntu 22.10

[Ubuntu 22.10 Desktop \(64-bit\)](#)

[Ubuntu Server 22.10](#)

Ubuntu 22.04.1 LTS

[Ubuntu 22.04.1 Desktop \(64-bit\)](#)

[Ubuntu Server 22.04.1 LTS](#)

Ubuntu 20.04.5 LTS

[Ubuntu 20.04.5 Desktop \(64-bit\)](#)

[Ubuntu Server 20.04.5 LTS](#)

# BitTorrent Topology

Trackers (Keeps track of who is seeding)

Leechers (Downloaders who may or may not be also helping others)

Seeders (Have a copy of a file and share pieces)

# Choosing the best order to download

## Piece Selection Algorithm

- First choose a random piece
- Then choose the piece that the fewest other members of the peer group have.
  - So you can be most helpful
- Repeat until you just need one last piece
  - This one is probably your slowest peer
  - So ask everyone else for it, and see if you can get it faster
  - Then cancel the other requests and be done

# Avoiding too many upload requests while downloading

## Choking

- Answer requests 4 at a time
  - Choke all others
- Open a 5th connection to see if you can find a more efficient peer
  - If you do, replace one of your favorite 4
- If you transfer nothing for 60 seconds, replace all of your favorite 4 as well
- Once you have downloaded, just seed to as many folks as ask

# Sharing Ratio

A way to measure how much time you spend taking from others vs sharing, yourself.

If your bytes downloaded equals bytes uploaded, you are sharing fairly.

If you are downloading far more than you upload, you are a leech



# Intellectual Property

An artificial rule invented to give people incentive to create new ideas by protecting their right to use it for a limited amount of time.

- Copyright on art, literature, music, and software
- Patents on manufacturing and software capabilities
- Trademarks on business logos
- Trade Secrets for misc things

In a world where anything can be readily copied and distributed around the world, stealing *value* from intellectual property is easy.

# Stealing vs Infringing

Infringing on Intellectual Property rights is not analogous to the violent seizure of ships (piracy). It is just called that.

The property owner's rights don't get taken and still has the IP

The damage done to the property owner is more similar to:

- Trespassing on real property

- Selling a knock-off product

- Sneaking outside snacks into a theater

- Riding public transit without paying a fare

# Illegal Use of Bittorrent

In USA, not only is actually committing crimes a crime, but conspiracy to commit crimes (agreeing in advance to help with a plan for crime) can get you in trouble.

BitTorrent is used to pirate movies, music, software, books, and other protected IP

If you torrent, the client will automatically seed what you have copies of when running, making everyone a distributor not just a consumer

# Sample Laws Broken with BitTorrent


DMCA “the act of circumventing a technological measure in order to gain access is prohibited”

SOPA “Any person who willfully infringes a copyright ... [including] the distribution or public performance of a work being prepared for commercial dissemination, by making it available on a computer network accessible to members of the public, if such person knew or should have known that the work was intended for commercial dissemination.”

5-year prison penalty for 10+ offenses or any work >\$2500

## Annual Copyright Infringement Reminder



All-nmsu <all-nmsu-bounces@nmsu.edu> on behalf of Carlos S Lobato <clobato@nmsu.  ...

To: all-nmsu

Sun 11/6/2022 12:34 PM

NMSU is required by federal law to remind its students, faculty, and staff about copyright infringement. Some within the NMSU community take advantage of "free" (aka illegal) music and movie download services, and then find themselves faced with copyright violations, fines, and other penalties.

It is against NMSU policy to illegally download copyrighted material; doing so can lead to an unwanted disciplinary event.

NMSU takes the illegal downloading of copyrighted material seriously, and so does the federal government. In fact, anyone found to have infringed on a copyrighted work through illegal downloading may be liable for statutory damages of up to \$30,000 for each infringed work. If willful infringement is proven by the copyright owner, that amount may be increased to up to \$150,000 for each occurrence.

Be smart, do not download copyrighted material without the legal right to do so.

# Detecting BitTorrent

Trackers are available on port 6969

Trackers know IP addresses and what was downloaded (subpoena if possible)

Regular traffic available on port range 6881-6889

But you can choose to run on any port

Deep packet inspection

Timing

# BitTorrent – Trackerless torrents

Remove trust in a torrent tracker

Requires peers to keep track of each other and who has what

Called the “BitTorrent Peer Exchange Extension”

Still rely on trackers to add and remove peers

Any peer can give out a subset of other peers to get pieces of files from