

# The Internet

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Will Leeson

# What led to the internet?

- Computers started to take off
  - Academic research
  - Military uses
- Need to share information
  - We could physically transport things
  - Telegraph allowed sending text
  - Expensive and/or error prone

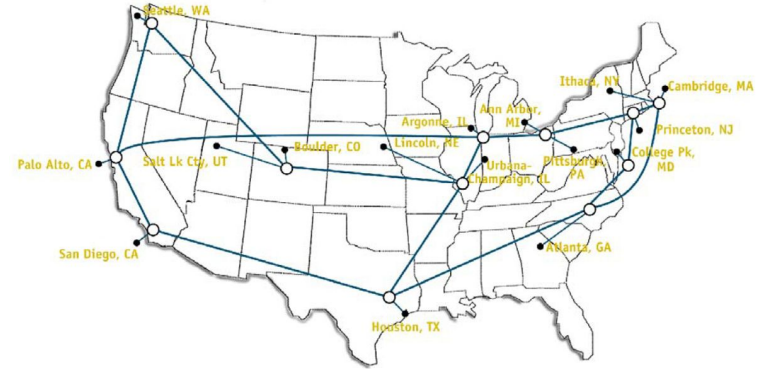




# From ARPANET to the Internet

- By the mid 70s, ARPANET flourished
  - Crossed the Atlantic
  - Averaged a new connection every 20 days
- Several other networks cropped up
  - NIPRNET (Military, unclassified)
  - SIPRNET and JWICS (Military, classified)
  - CSNET (Research and Academic)
- NSFNET
  - Supported by the National Science Foundation
  - The “backbone” of the internet
- Connecting networks became the “Inter-net”

**NSFNET T3 Network 1992**

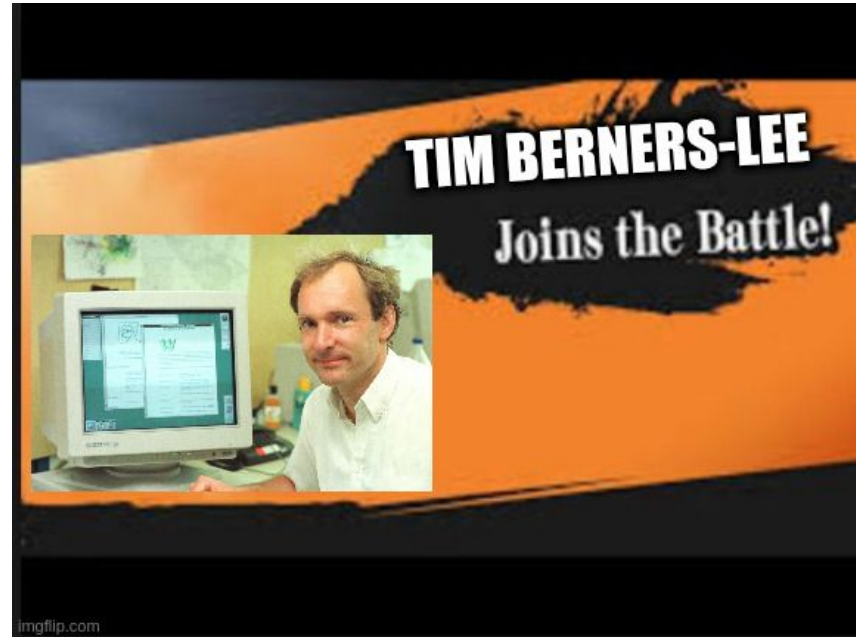


# The Early Days of the internet

HOW STANDARDS PROLIFERATE:  
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)



# A Hero Emerges



# Setting the Stage for a Standard

- CERN
  - European Organization for Nuclear Research
  - Currently 33 Members
  - The Largest Internet node in Europe
- Tim Berners-Lee
  - British Computer Scientist
  - Employ at CERN
  - Frustrated at lack of standardization



# The World Wide Web

- Created by Berners-Lee in 1990
- A standard for navigating the Internet
- Three crucial components
  - Uniform Resource Locator (URL)
  - Hypertext Transfer Protocol (HTTP)
  - Hypertext Markup Language (HTML)





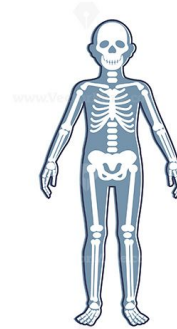
# The World Wide Web (W3)

- Uniform Resource Locator (URL)
  - Colloquially, a Web address
  - A location for something on the internet
  - Web page (HTTP), Files (FTP), email (mailto), etc.
- Hypertext Transfer Protocol (HTTP)
  - Rules for communication across the W3
  - Describes interaction between client (You) and server (Host of webpage)
- HyperText Markup Language (HTML)
  - Language for displaying web pages



# HTML, CSS, and Javascript

- The core languages of the web
- HyperText Markup Language (HTML)
  - Controls the content of the webpage
  - **Very** basic stylizing
- Cascading Style Sheets (CSS)
  - Changes the look of the content
  - Integrated closely with HTML
- JavaScript
  - Allows dynamic content
  - Playing games, streaming media, login
  - *Not* related to Java programming language



HTML



HTML + CSS



HTML + CSS + JavaScript

# A Trip Down Memory Lane

The screenshot displays the eBay homepage with the following elements:

- Navigation Bar:** Browse | Sell | Services | Search | Help | Community
- Search Bar:** Find it! tips
- Categories:** Automotive (NEW!), Antiques & Art (115100), Books, Movies, Music (785717), Coins & Stamps (167721), Collectibles (1077569), Computers (145736), Dolls, Doll Houses (73276), Great Collections (NEW!), Jewelry, Gemstones (181355), Photo & Electronics (90141), Pottery & Glass (239921), Sports (541936), Toys, Bean Bag Plush (399499), Everything Else (462618), all categories...
- Hot Picks:** Vintage Pez, Flat Panel Monitor, Porsche, Batman, Doll Houses
- Best of HOLLYWOOD:** Click here for behind-the-scenes mementos...
- Featured Items:** Very Strong 1/2" X 3/32" rare earth Magnets!, 80mm WORLD GLOBE Lapis, Lazuli, Semi Precious Kurt Warner mini Autographed helmet!! MVP electric wheelchair, Elegant Sync-Time Watch for him & her New!, All 20 New New Ty 2000 Beanie Babies!! Cc Ok
- See all featured...**
- eBay Great Collections:** Exquisite, Unique. Bold. The best in contemporary photography is now online. Just a click away.
- Shop by photos in the Gallery:** Bid locally, Need it now? Find it next door. Pick a region, Go There!
- Fun Stuff:** Cool Happenings, Charity Auctions
- Power Trading:** Bid on items for Rosie's For All Kids Foundation. eBay Power Trading—now featuring Mister Lister!
- Stats:** 4,288,454 items for sale in 4,320 categories now! Over 1.5 billion page views per month!
- Left Sidebar:** msn News & Sp, News, Slate Magazi, Sports by FC, Video, Weather, Look it Up, City Guides, Classifieds, Encarta Educ, Maps & Direc, White Pages, Yellow Pages, Living & Fil, Autos, Careers & Jo, Dating & Per, Health & Fitr, Lifestyle
- Right Sidebar:** SignOut, Classifieds, SIGN IN, Ad feedback, 20 min.

# Web Frameworks

- You no longer have to start from scratch!
- Someone designs a pattern
- You fill in some blanks
- You get a fancy website

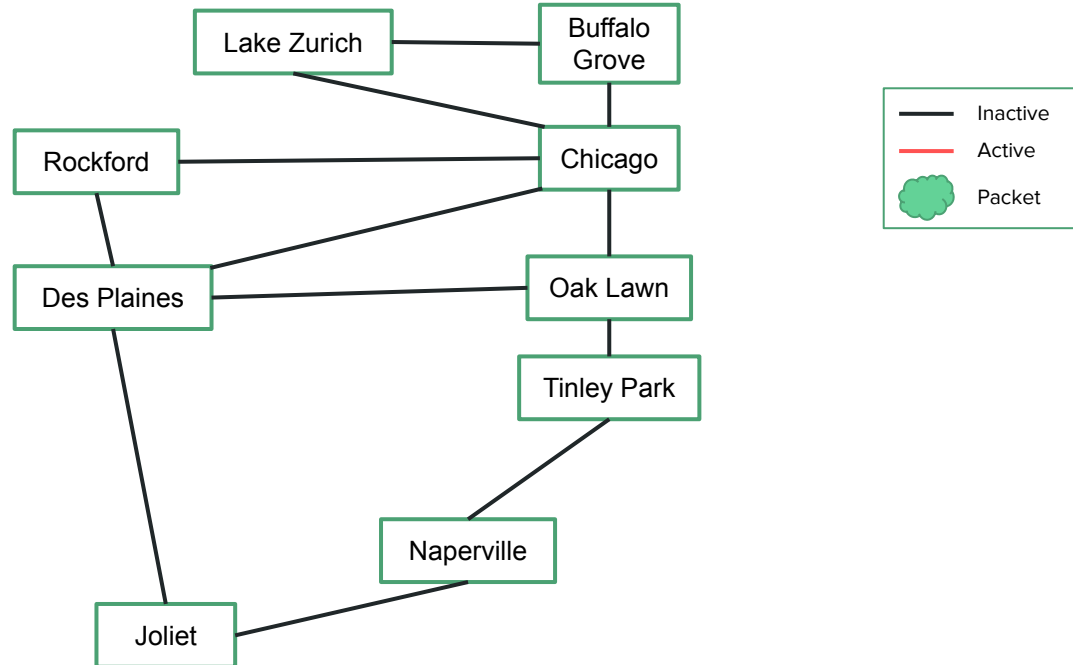


So how the internet  
does it work?

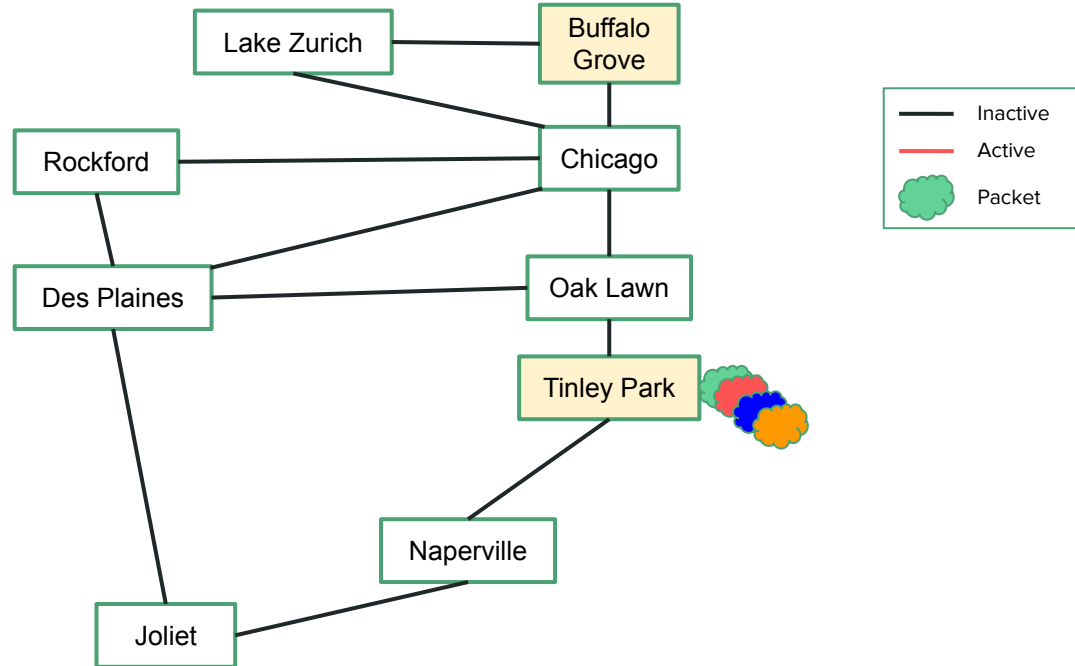
# Packets!

- Information is divided into “packets”
- Packets can be sent independently
  - Allows parallelization
  - Helps balance traffic
  - Can store information in multiple locations
- Packets are collected at destination
  - Regrouped in the correct order
  - Data has successfully gone through the network

# Sending Information

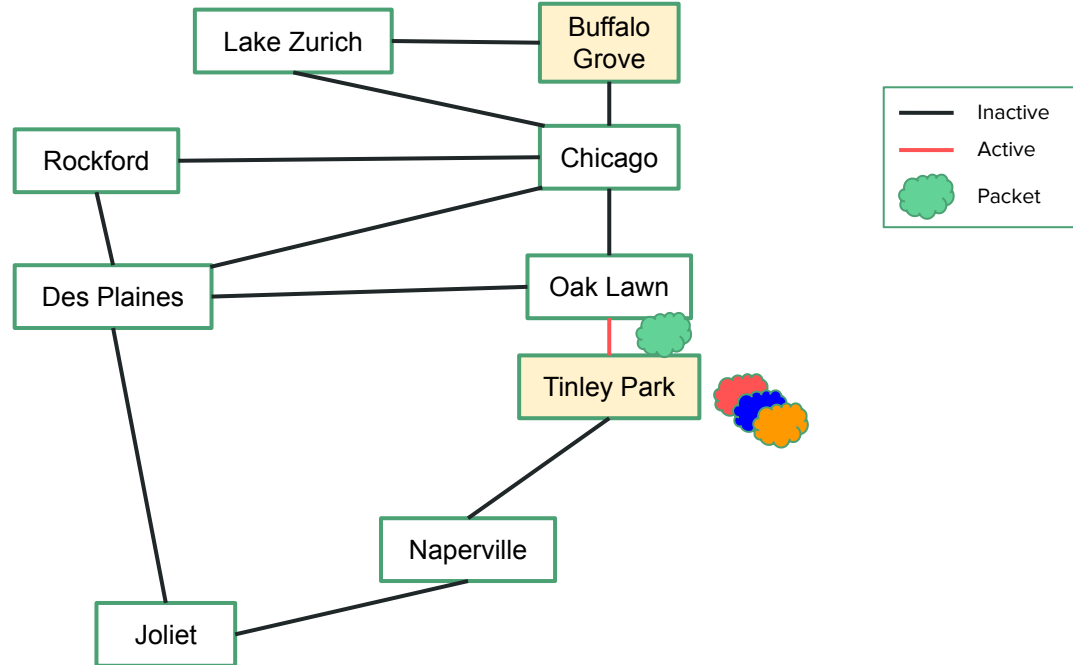


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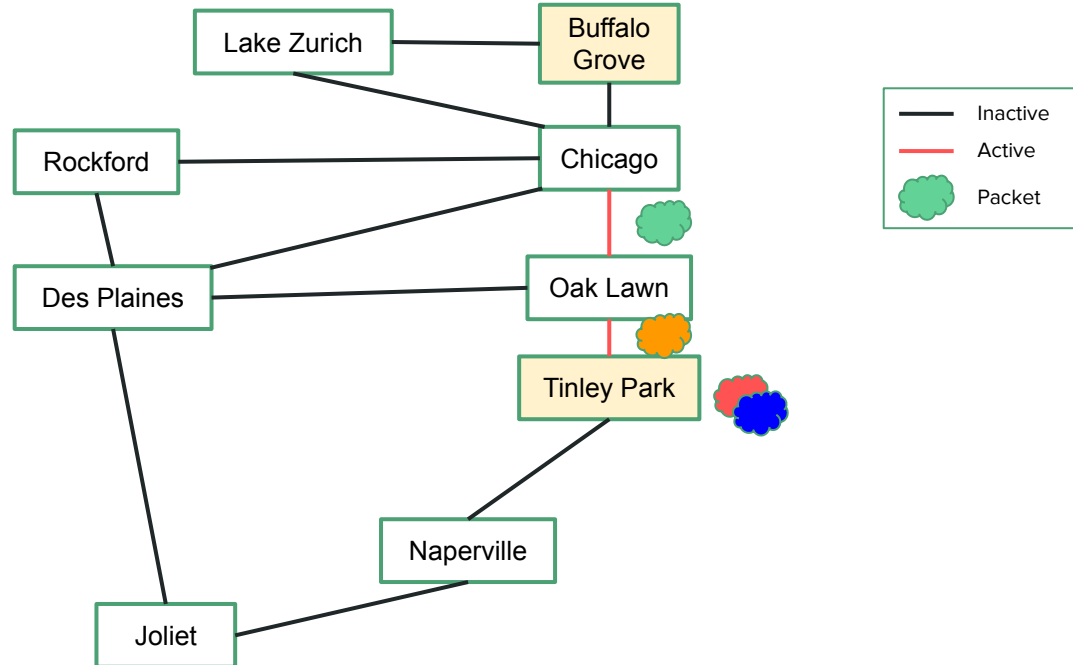




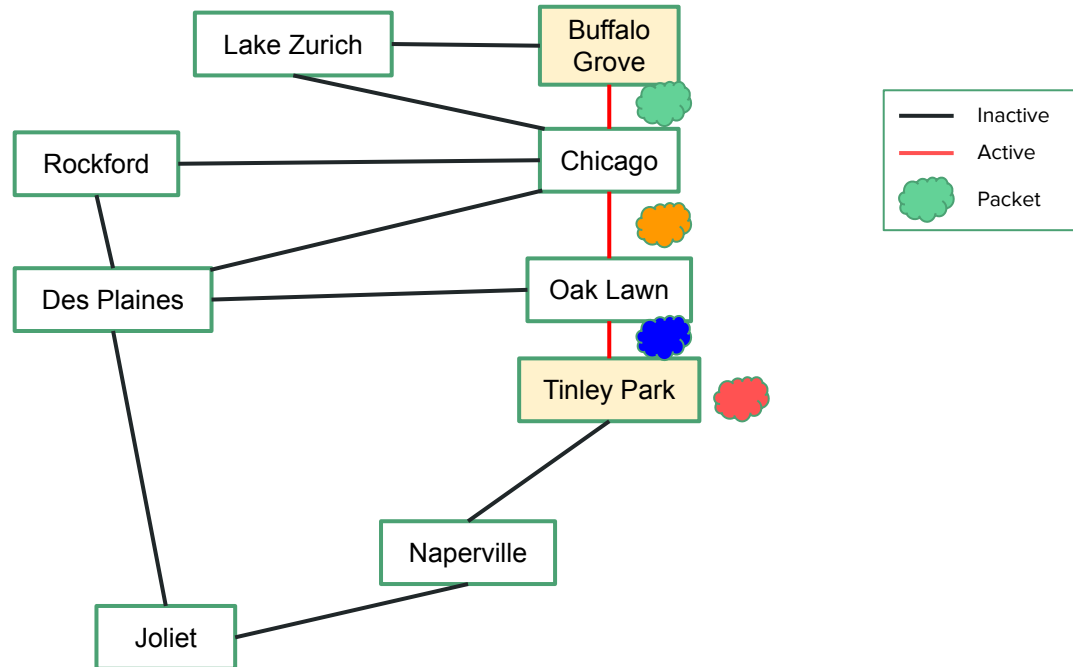
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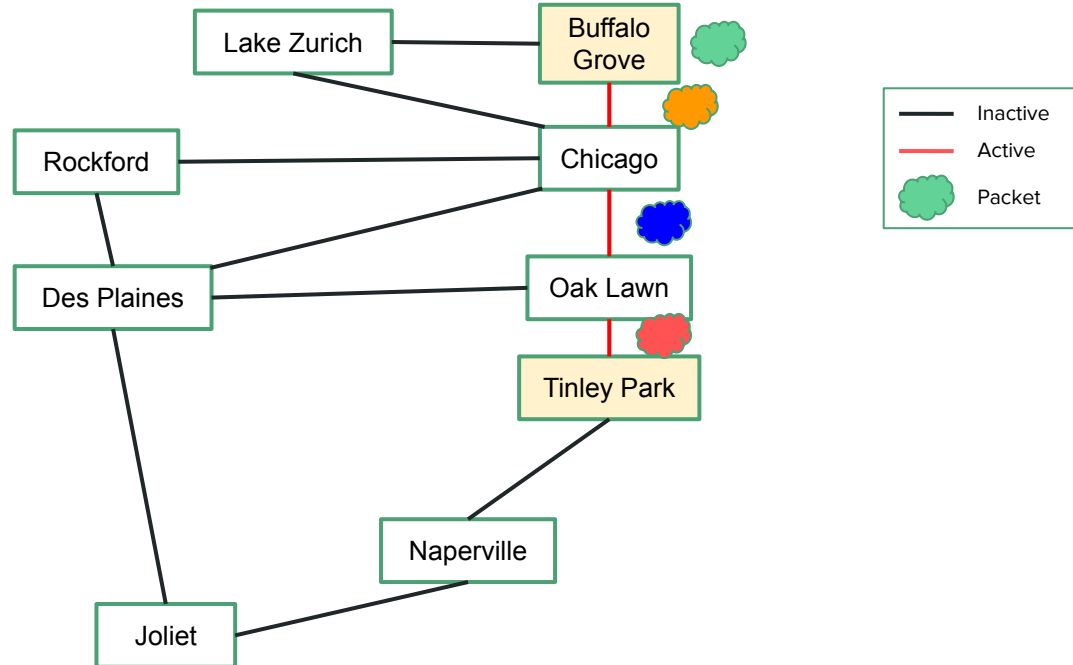
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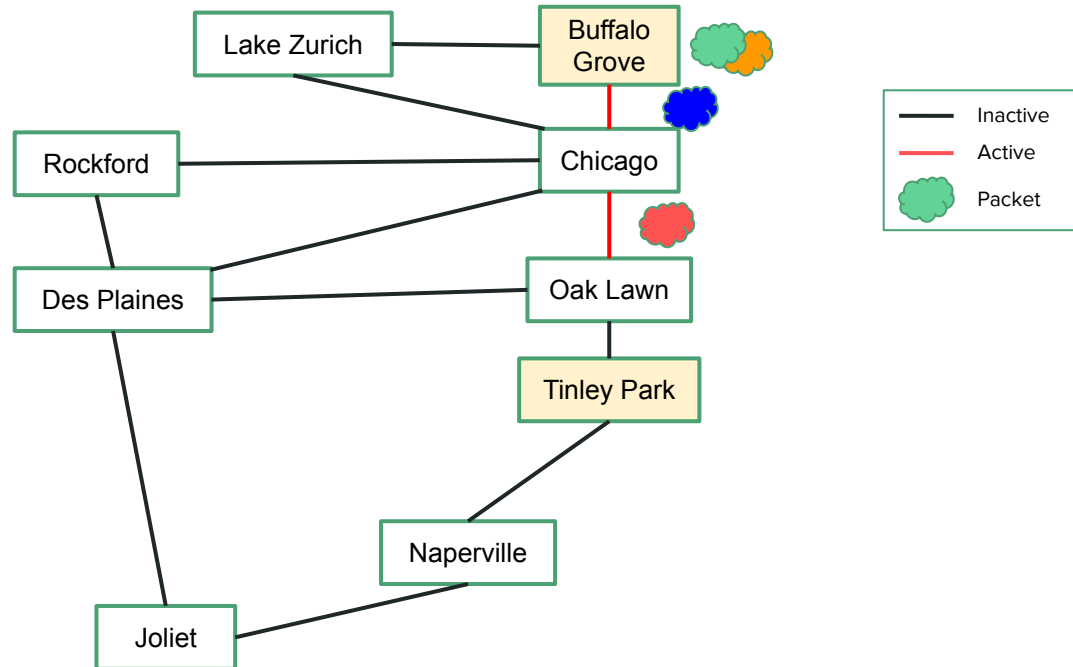
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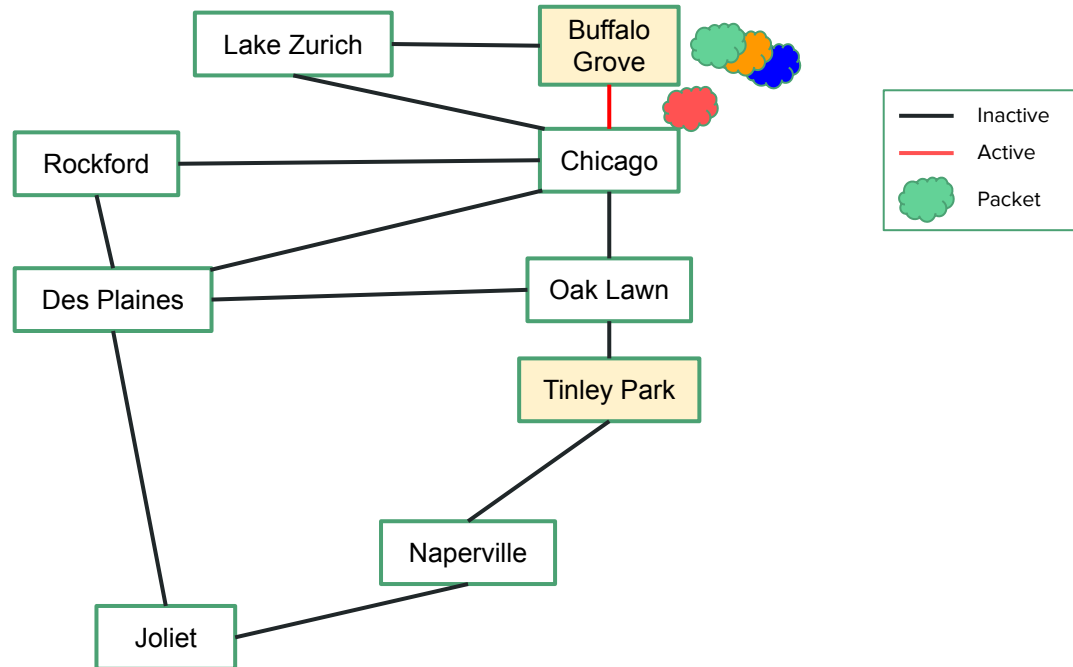
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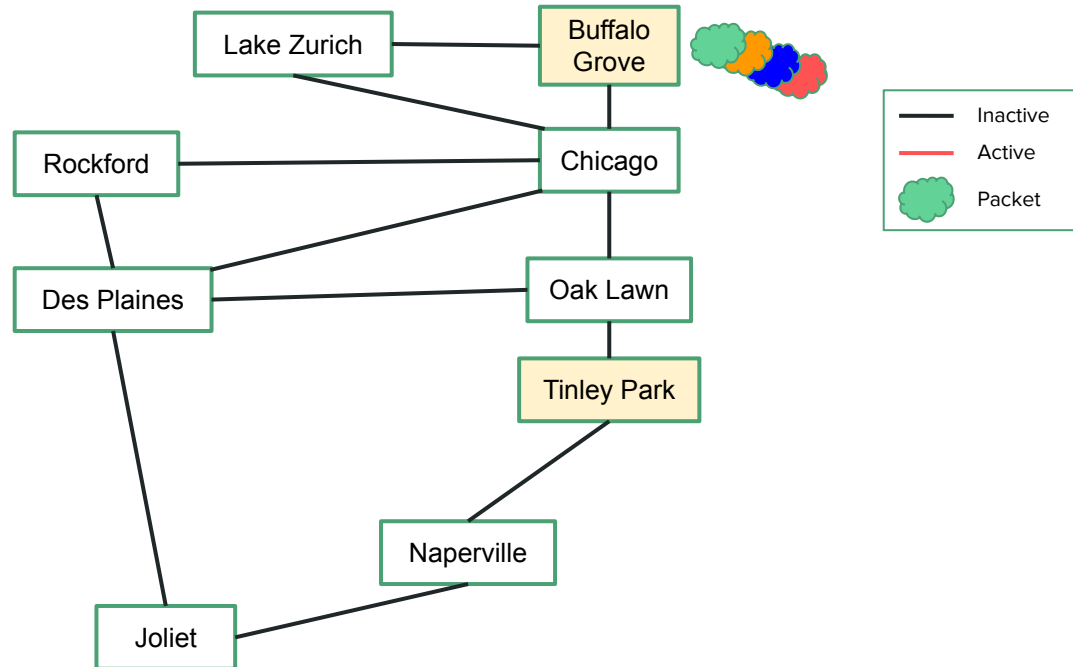
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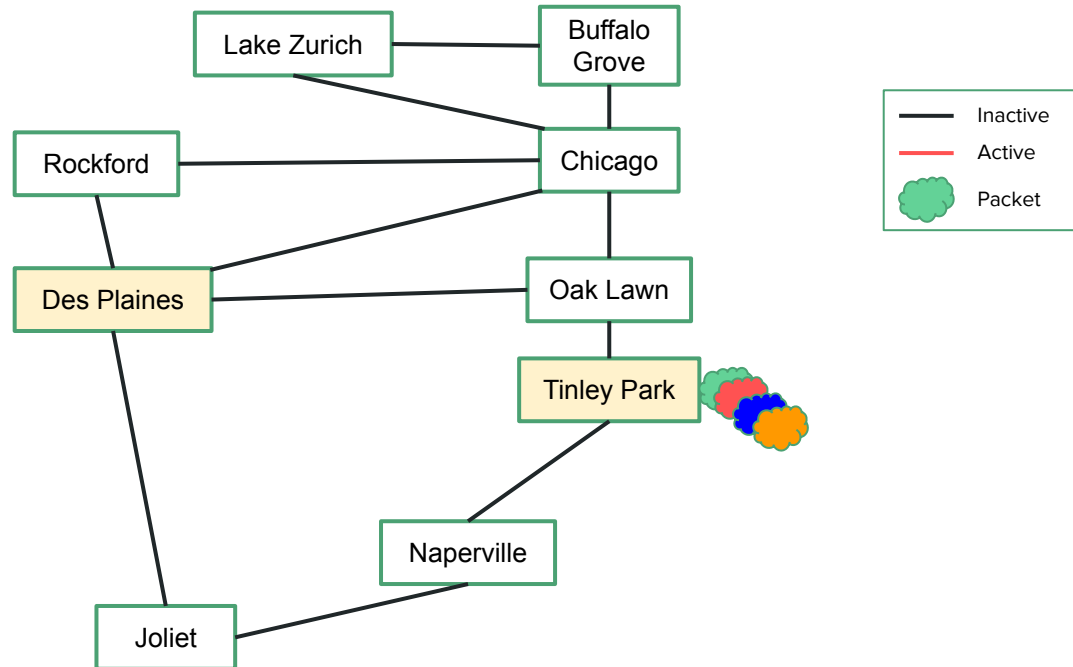
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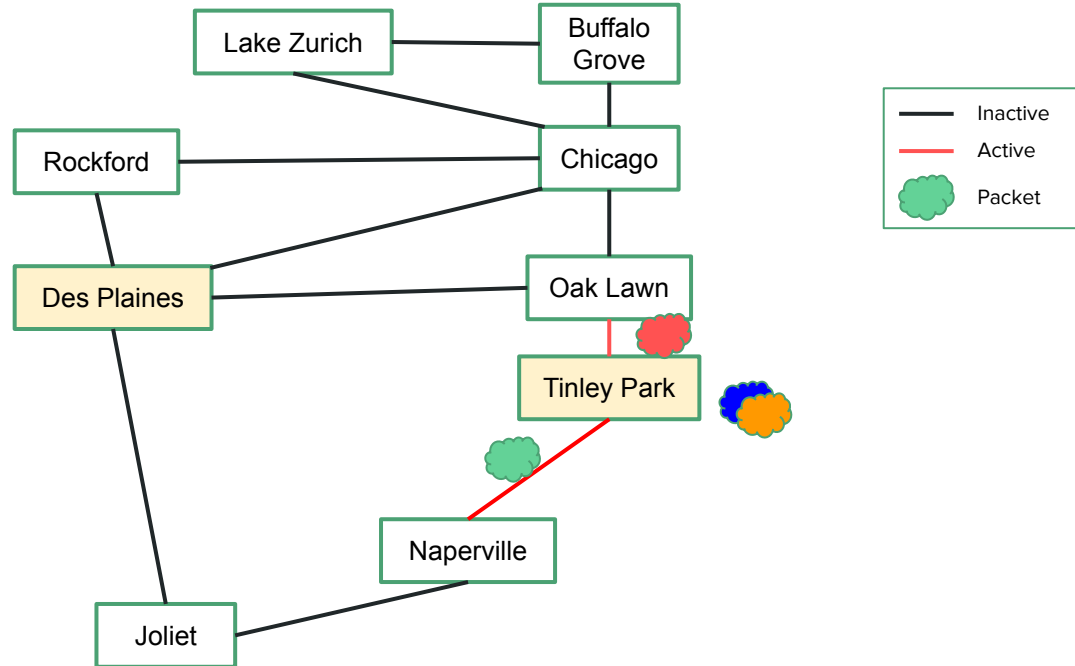


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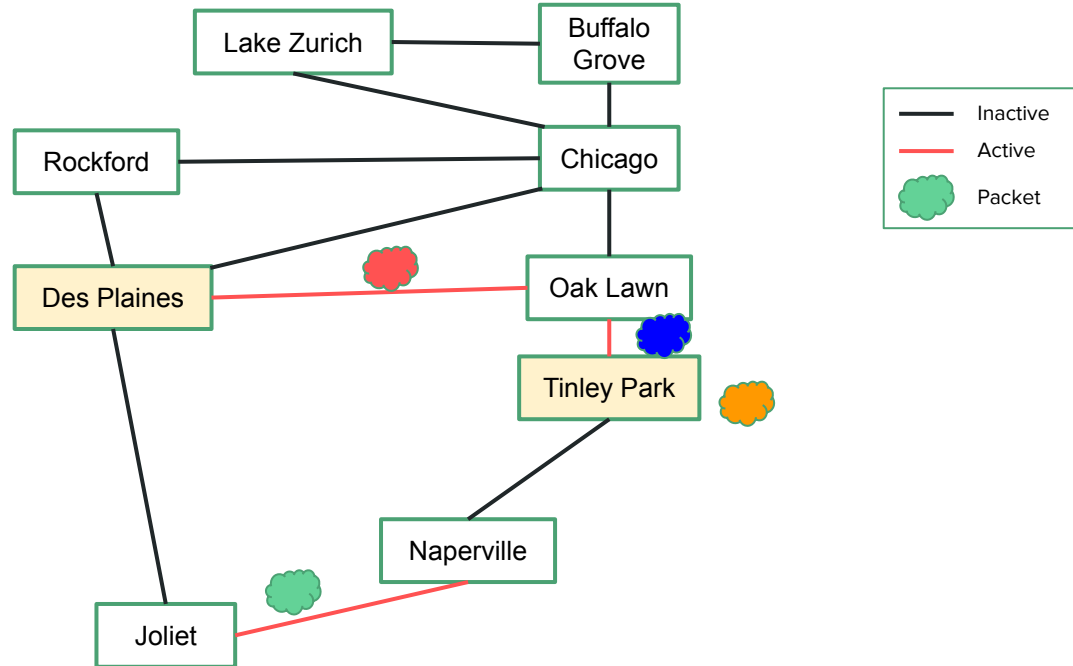




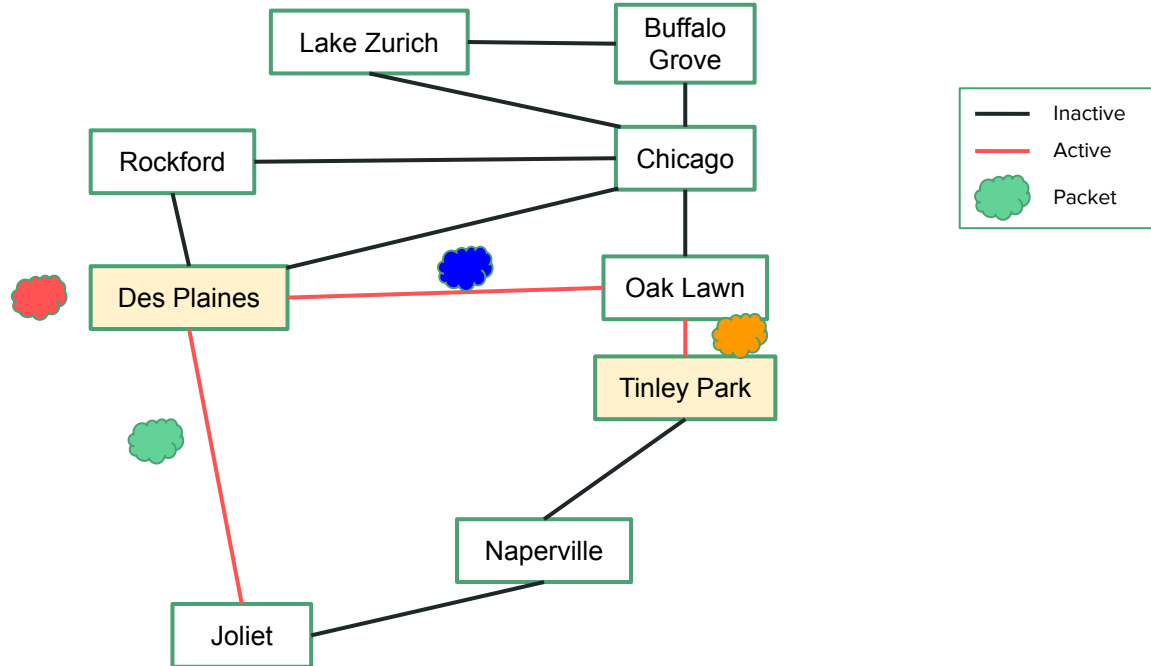
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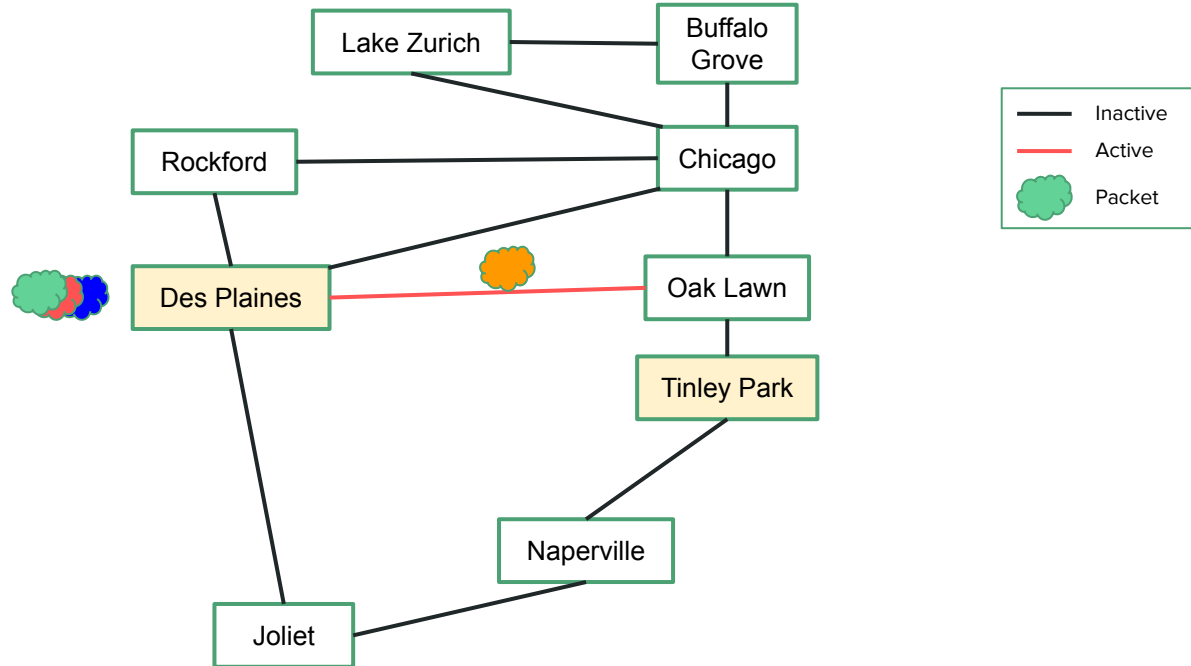
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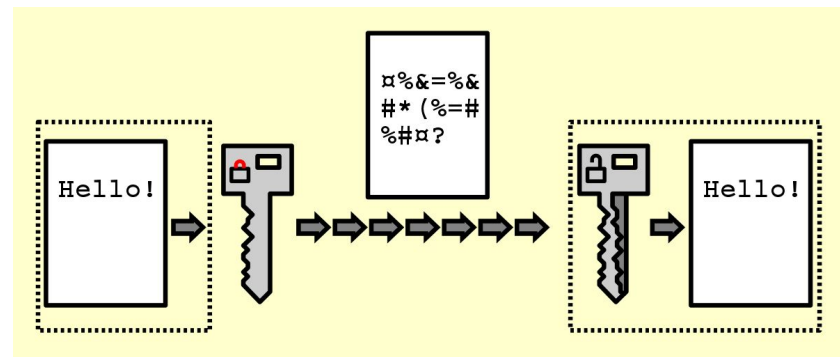


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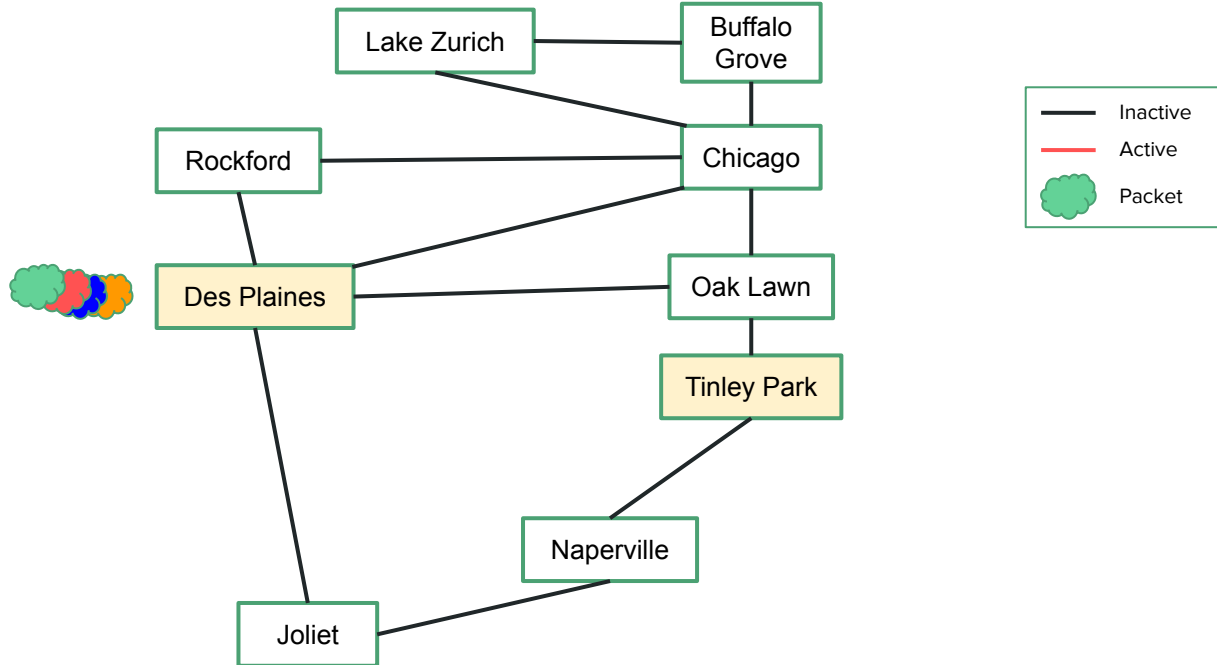


# Encryption

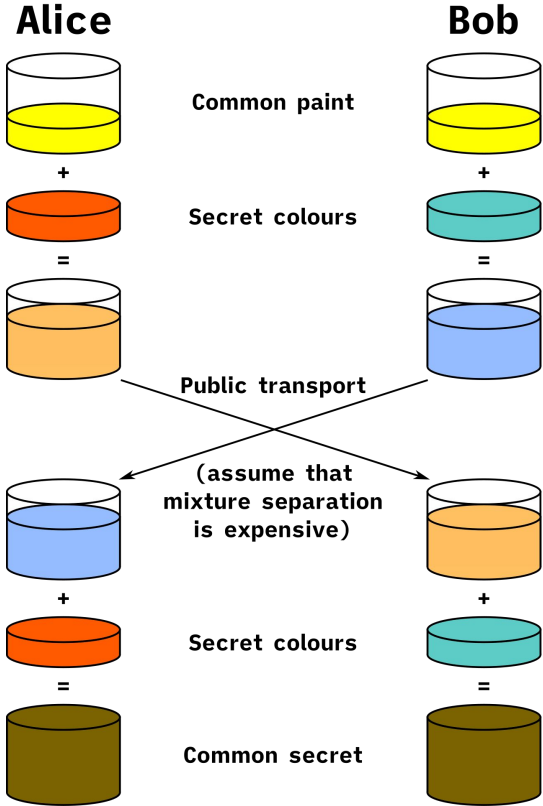
- Packets are sent over the air
  - Anyone can see them
  - Anyone can read them
- Packets can contain sensitive info
  - Passwords
  - Bank Information
  - A draft of the letter you want to send your crush
- Luckily, we can obscure this info
  - Encryption (Like the cipher we did)
  - We need to share a key
    - But others can't know the key



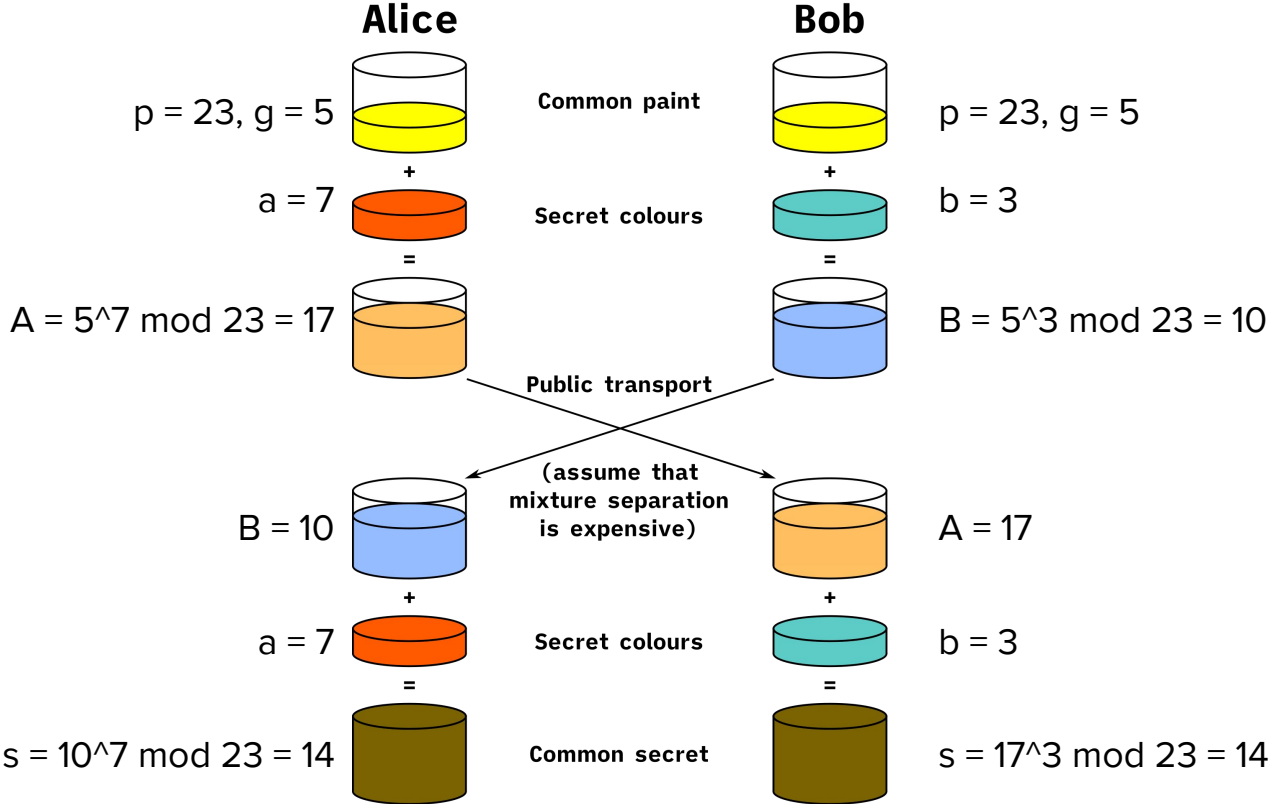
# Sending Information



# Diffie-Hellman Key Exchange



# Diffie-Hellman Key Exchange





# Diffie-Hellman Key Exchange

- Paints = Numbers
- Mixing Paint = Raising number to a power (modulo a number)
  - Reversing this is suuuuuuuuuuuuuuuuuuuuper hard
  - Like it would take 1 year to crack a single key
  - And \$100,000,000 of compute power
  - So, we're safe
  - For now...