

# Introduction to Computer Networks

## CDNs (Content Delivery Networks) (§7.5.3)



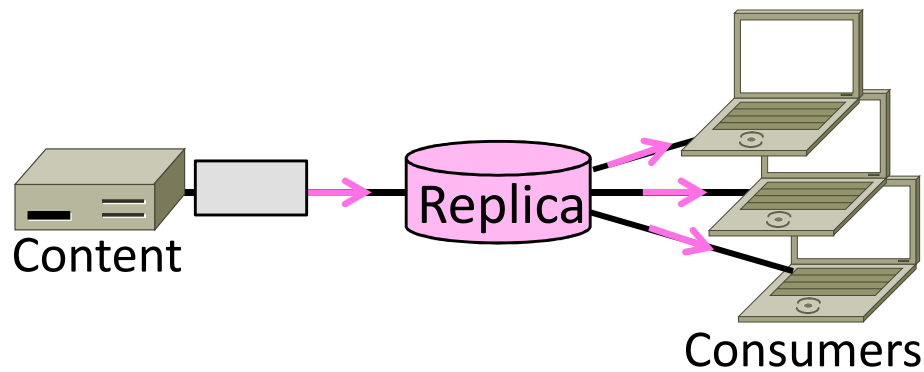
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# Topic

- CDNs (Content Delivery Networks)
  - Efficient distribution of popular content; faster delivery for clients



# Context

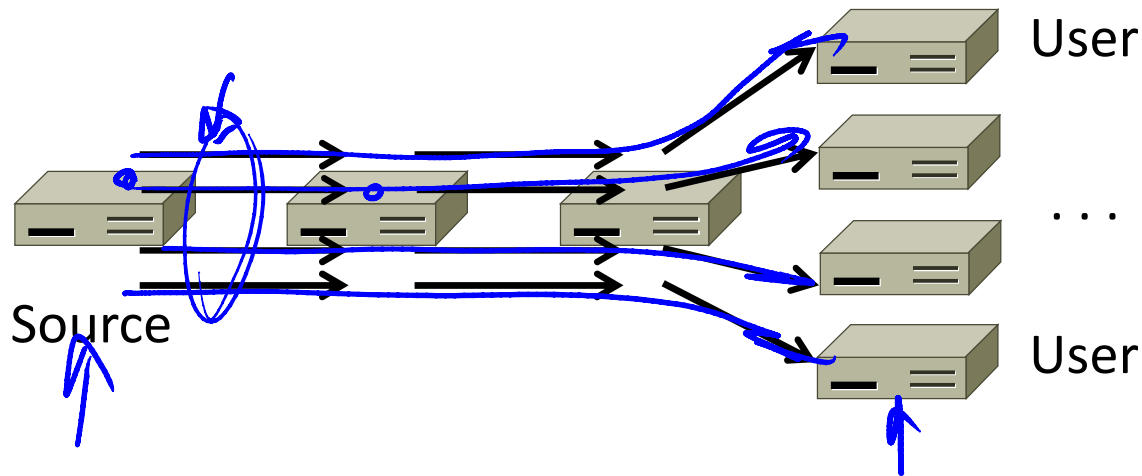
- As the web took off in the 90s, traffic volumes grew and grew. This:

- ➔ 1. Concentrated load on popular servers
- ➔ 2. Led to congested networks and need to provision more bandwidth
- ➔ 3. Gave a poor user experience

- Idea:
  - Place popular content near clients
  - Helps with all three issues above

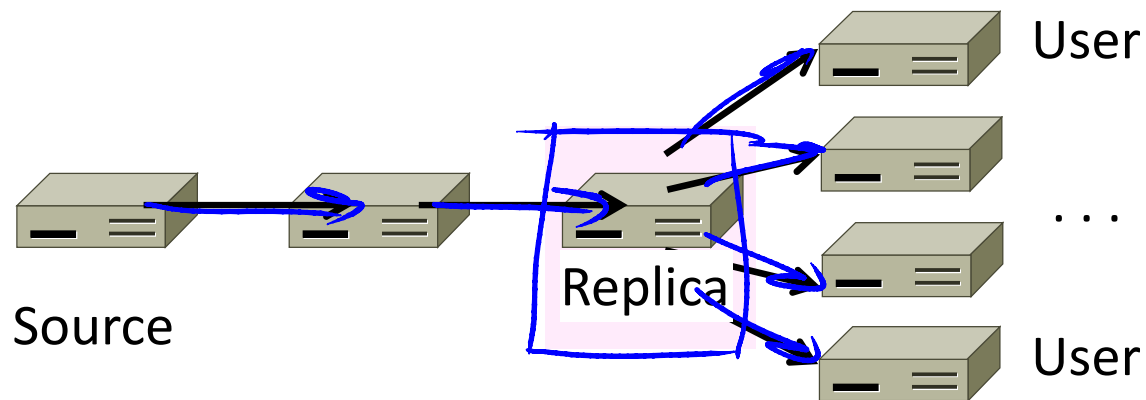
# Before CDNs

- Sending content from the source to 4 users takes  $4 \times 3 = 12$  “network hops” in the example



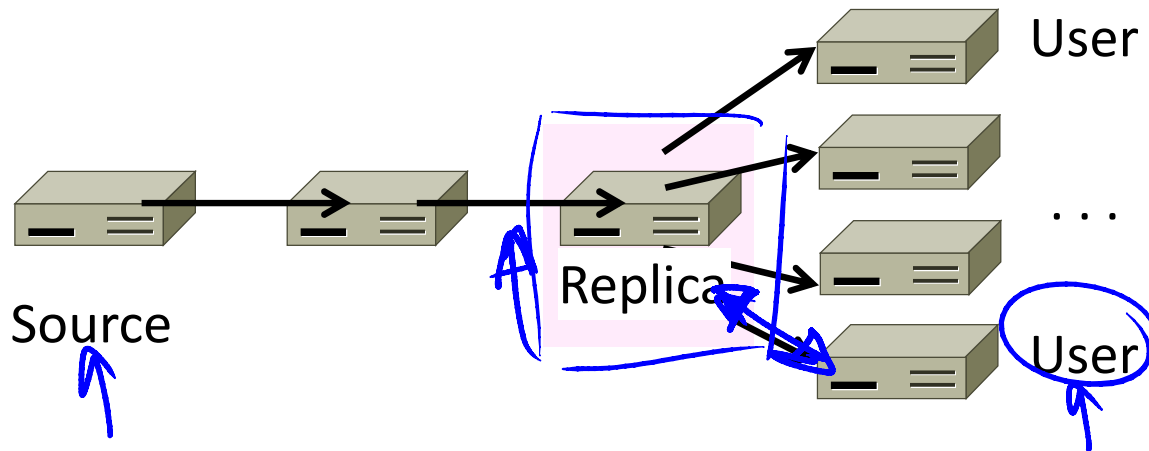
# After CDNs

- Sending content via replicas takes only  $4 + 2 = 6$  “network hops”



## After CDNs (2)

- Benefits assuming popular content:
  - Reduces server, network load
  - Improves user experience (PLT)



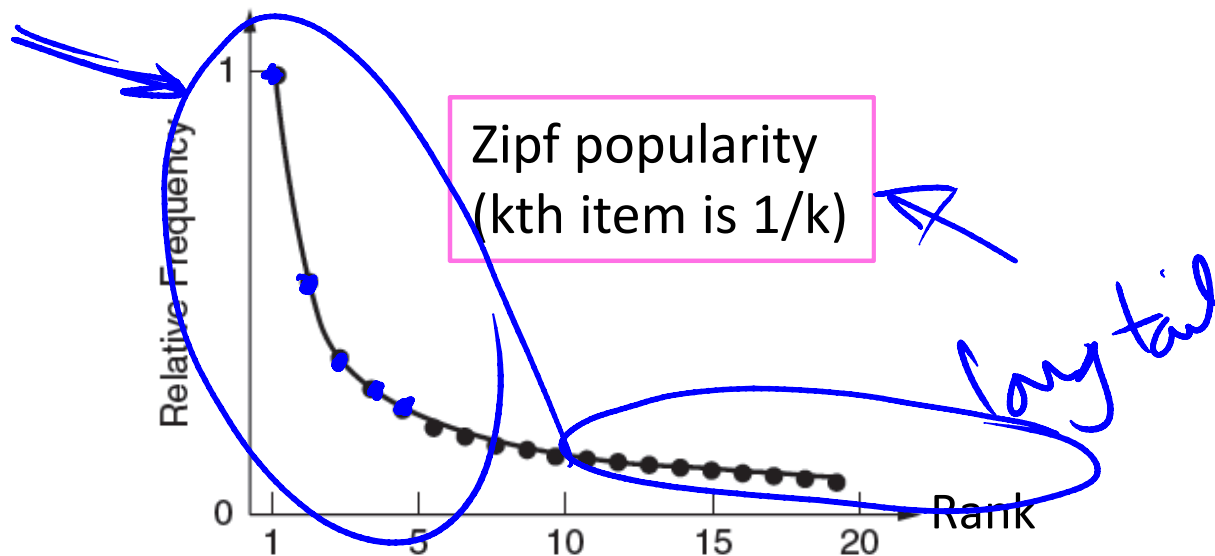
# Popularity of Content

- Zipf's Law: few popular items, many unpopular ones; both matter

George Zipf (1902-1950)



Source: Wikipedia

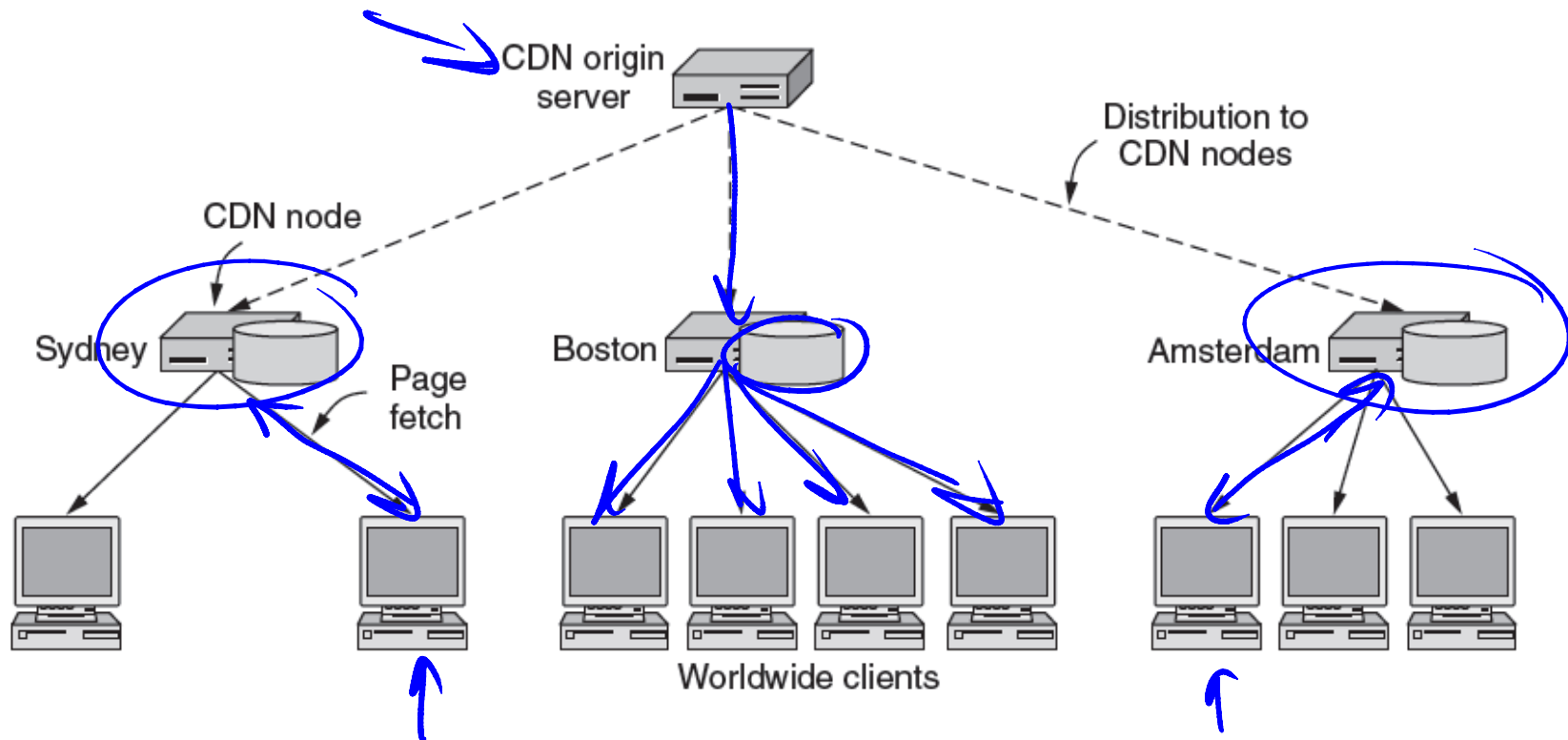


# How to place content near clients?

- Use browser and proxy caches
  - Helps, but limited to one client or clients in one organization
- Want to place replicas across the Internet for use by all nearby clients
  - Done by clever use of DNS

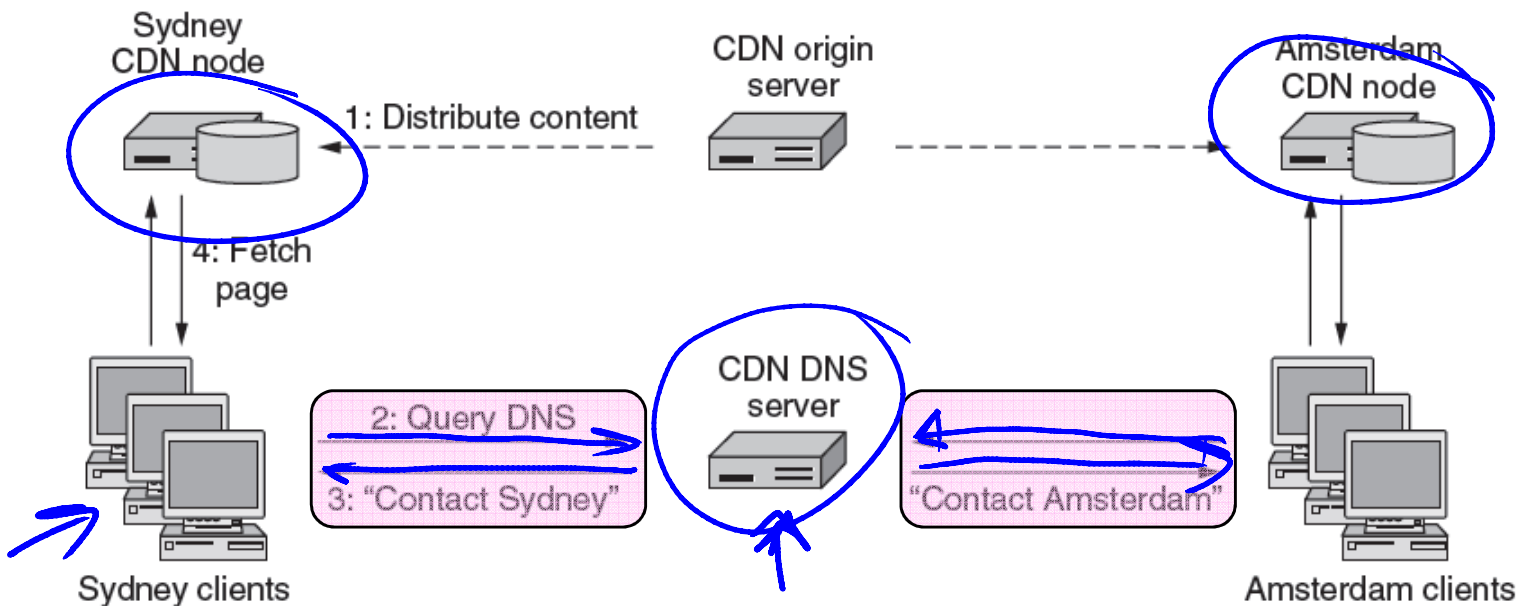


# Content Delivery Network



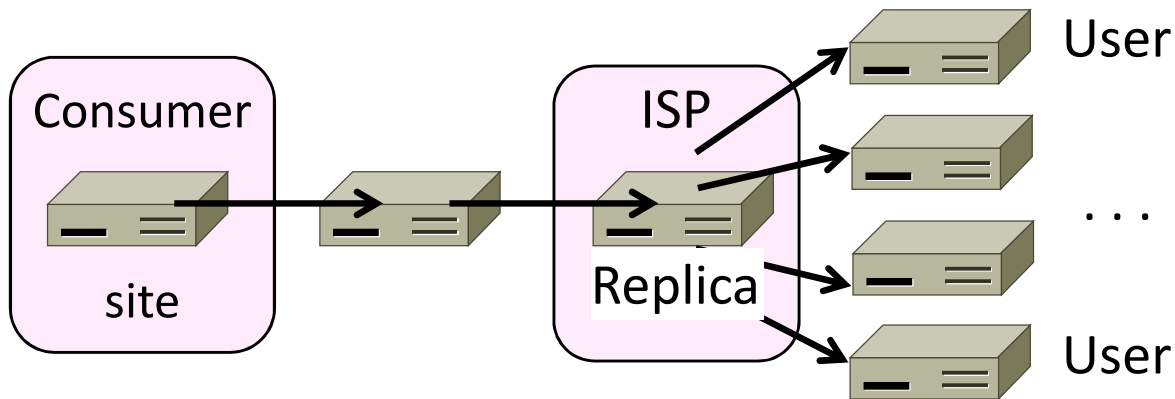
# Content Delivery Network (2)

- DNS resolution of site gives different answers to clients
  - Tell each client the site is the nearest replica (map client IP)

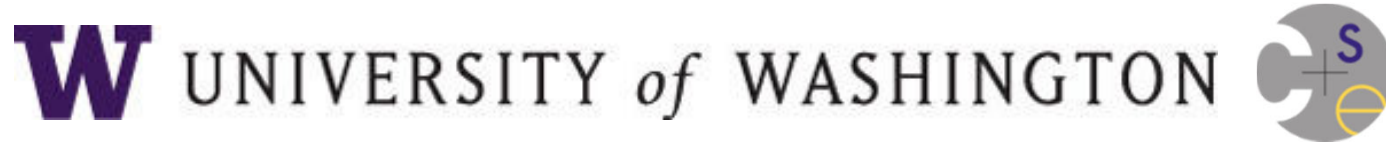


# Business Model

- Clever model pioneered by Akamai
  - Placing site replica at an ISP is win-win
    - Improves site experience and reduces bandwidth usage of ISP



# END



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