DDoS attacks are a common type of cyber attack. The graph shows the evolution of DDoS attacks from 2004 to 2015.

- In 2004, the attack volume peaked at 8 Gigabytes (Gigabytes DDoS).
- In 2010, the attack volume peaked at 100 Gigabytes (Gigabytes DDoS).
- By 2015, the attack volume peaked at 500 Gigabytes (Gigabytes DDoS).

This trend indicates a steady increase in the power and frequency of DDoS attacks over the years. For more information, visit https://www.reveelium.com/en/ddos-attacks-the-cyber-boogeyman-part-i/
DDoS Attacks

Peak Attack Sizes Through March 2018

1,700 Gbps!!

2015 :-/

Cloudflare

133 datacenters

https://blog.cloudflare.com/usa-expansion/
Cloudflare

133 datacenters

Without CloudFlare

Slow pipes

Visitor

Crawlers and bots

Your naked website

Attackers

With CloudFlare

Fast pipes

Visitor

CloudFlare's globally distributed network

Crawlers and bots

CloudFlare protected website

Attackers

https://support.cloudflare.com/hc/en-us/articles/205177068-Step-1-How-does-Cloudflare-work-
Disney: Large-scale rendering

Without global illumination:

https://www.disneyanimation.com/technology/innovations/hyperion
Disney: Large-scale rendering

With global illumination:

https://www.disneyanimation.com/technology/innovations/hyperion
Disney: Large-scale rendering

Without global illumination:
Disney: Large-scale rendering

With global illumination:

https://www.disneyanimation.com/technology/innovations/hyperion
Disney: Large-scale rendering

- “San Fransokyo” contains 83,000 buildings, 260,000 trees, 215,000 streetlights, and 100,000 vehicles. City detail is based on assessor data from San Francisco.

- Rendered in four geographically-distributed datacenters.

- 55,000 CPU cores, 400 TB of memory.

- Many system failures!

https://www.engadget.com/2014/10/18/disney-big-hero-6/
http://www.electronicdesign.com/blog/disney-supercomputer-renders-big-hero-6
Google Chrome: More complex than you think!

https://www.chromium.org/developers/design-documents/multi-process-architecture
Google Chrome: More complex than you think!

http://szeged.github.io/sprocket/architecture_overview.html
Google Chrome: More complex than you think!

• Performance considerations: browsing the web should be fast

• Architecture considerations: new web technologies are enabling sophisticated web applications
  • Multithreaded javascript (web workers)
  • HTML5 media APIs
  • High-performance 3D graphics via OpenGL/WebGL
  • Even raw assembly execution! (WebAssembly)

• Security considerations: we need to keep your bank account safe from shady websites

• The modern browser is sort of its own operating system!
Course website

https://cs110.stanford.edu
• This class is well-oiled…

• But also somewhat of an experiment
  • I have never taught CS 110 before
  • CS 110 has never been taught over the summer (by anyone)

• The course scheduling and lecture pacing are somewhat of an experiment

• Weekly surveys: nominal amount of extra credit
Ways to get help

• Office hours
• Piazza
• Slack
• Summer Academic Resource Center
• Email me if you need more resources or support!
Assignment policies

- We generally won’t look at your code
- No late days
  - Assignments turned in within 24 hours of the deadline are capped at 90%
  - Assignments turned in within 48 hours of the deadline are capped at 60%
Labs / discussion sections

- Optional
- Thursdays and Fridays
- Start this week! Sign up on the course website