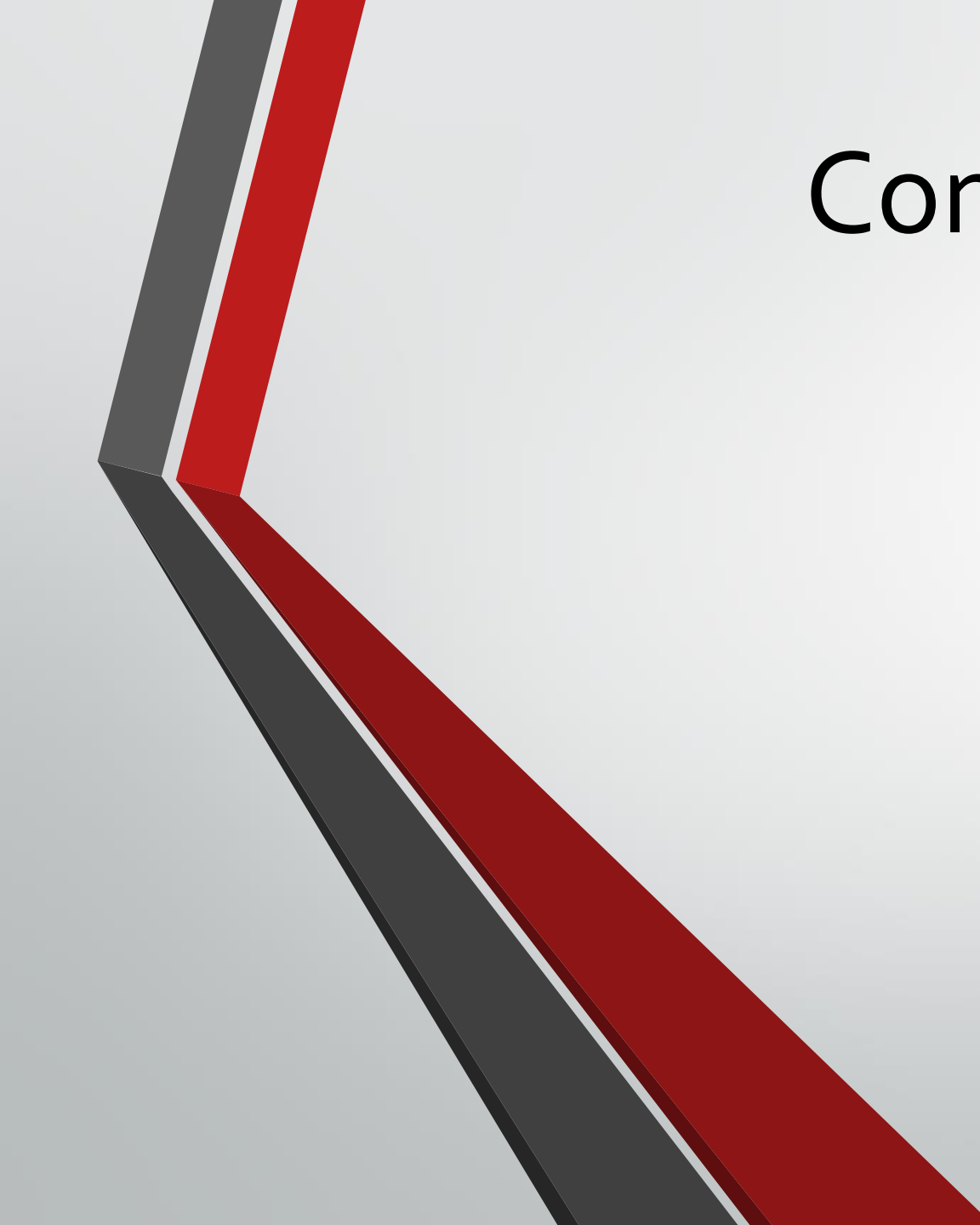




Computing Systems and Networks! Part 2

Protocols

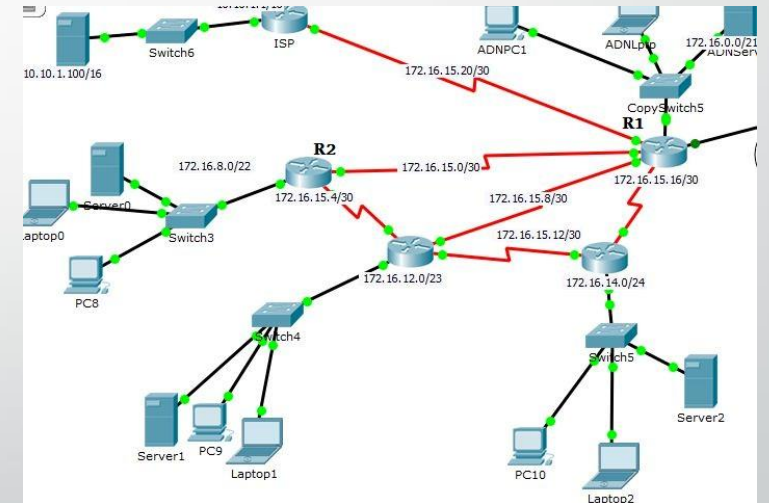
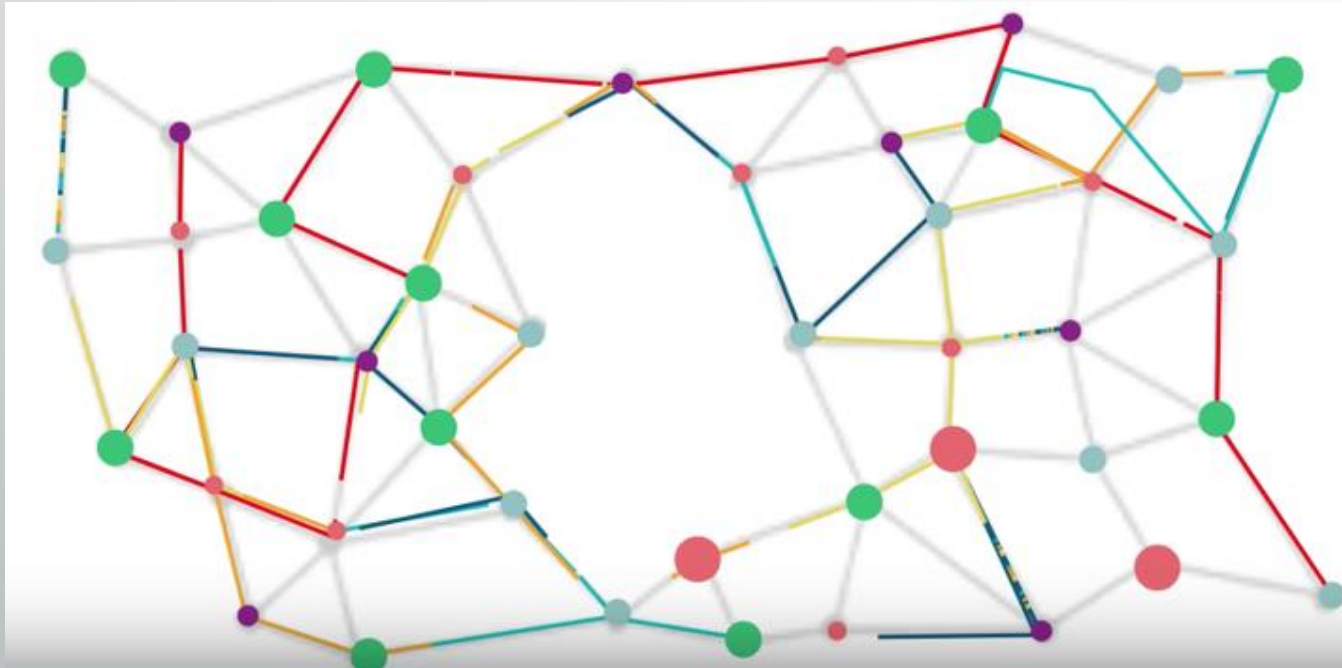
Fran Trees (fran.trees@cs.rutgers.edu)

LAST TIME:

- Activities:
 - Orange Game—routing, deadlock, and redundancy
 - Tablets of Stone—transmission of information in packets



The Internet: Network of networks



Rules that govern the Internet !

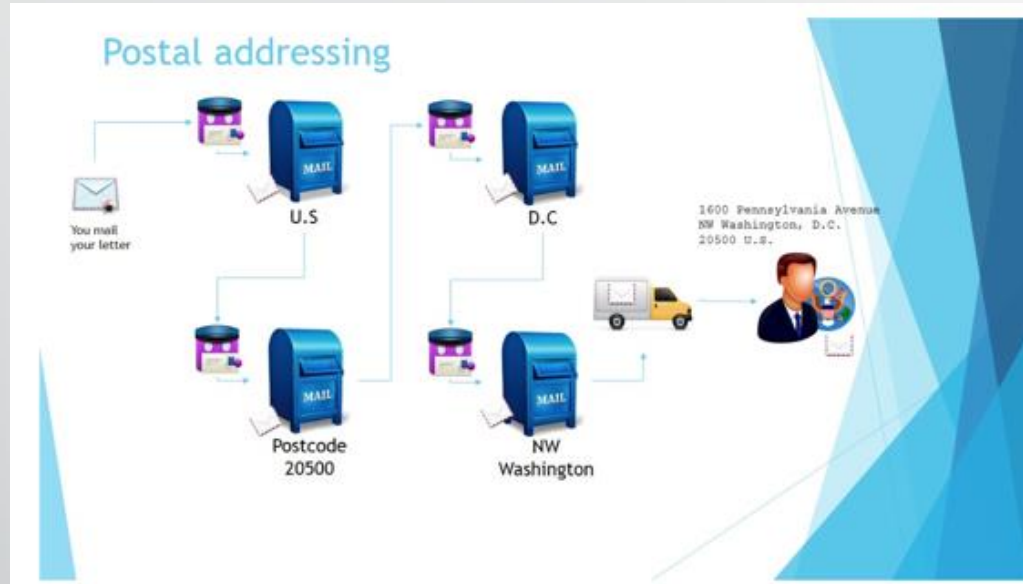
PROTOCOL

A WELL-KNOWN SET OF RULES AND STANDARDS
USED TO COMMUNICATE BETWEEN MACHINES

- TCP/UDP/ IP
- SSL/TSL
- HTTP/HTML

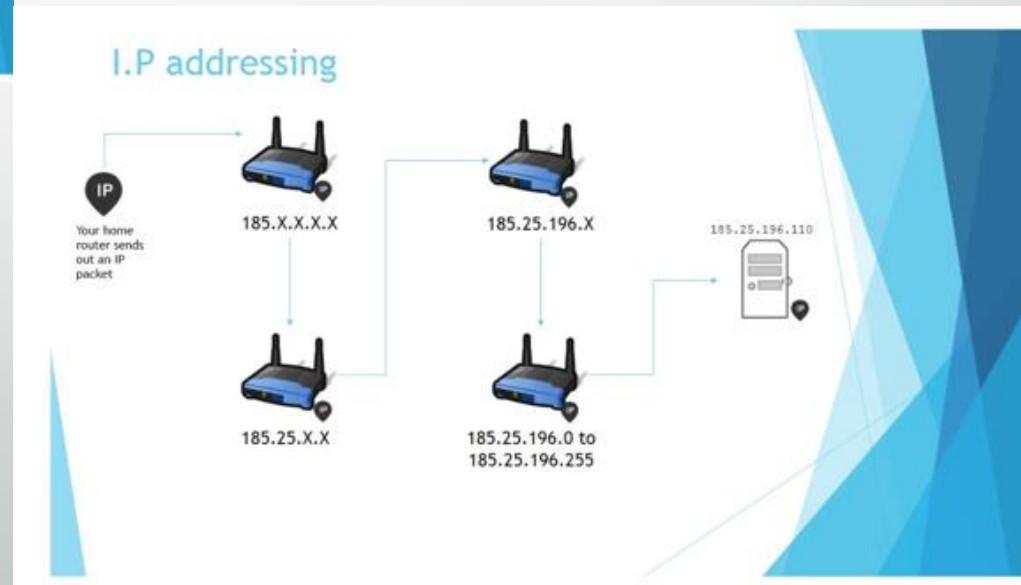


Internet Protocol (IP) --- US Mailing System



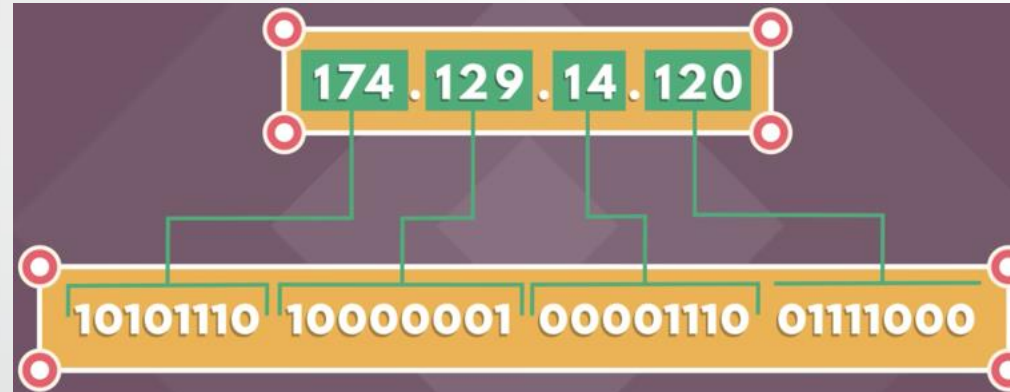
Country, city, street, house number

Country, region, subnetwork, device



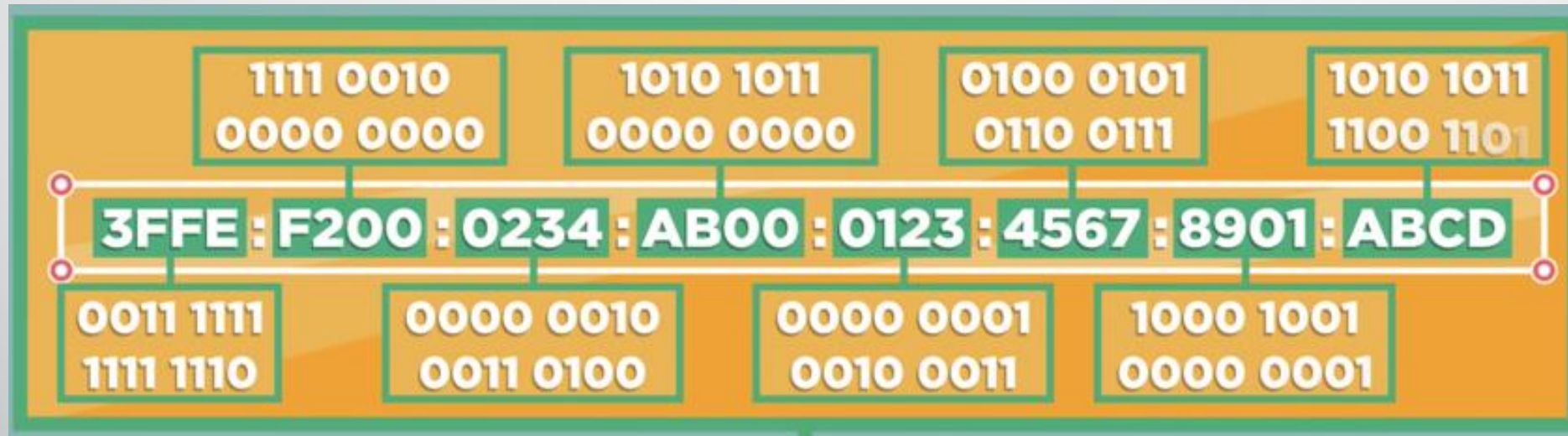
Internet Protocol (IPv4)

More than 4 billion addresses



Internet Protocol (IPV6)

3FFE:F200:0234:AB00:0123:4567:8901:ABCD



Internet Protocol (IP)

- Devices on the Internet have unique addresses
 - IP Addresses
 - To find your current IP address: <https://whatismyipaddress.com/>
 - Google: What is my IP
 - How private are you???



IP addresses – IPV4

- Whatismyipaddress.com: IPv4: 24.246.235.186
- PING ftrees.com: (216.239.38.21)
- PING rutgers.edu: (128.6.68.140)



Domain Name System (DNS)

<https://whatismyipaddress.com/>

- Looks up Domain Name (www.rutgers.edu) and gets associated IP Address

IP Details for 128.6.68.140

This information should not be used for emergency purposes, trying to find someone's exact physical address, or other purposes that would require 100% accuracy.

Lookup IP Address

Details for 128.6.68.140

IP: 128.6.68.140

Decimal: 2147894412

Hostname: rutgers.edu

ASN: 46

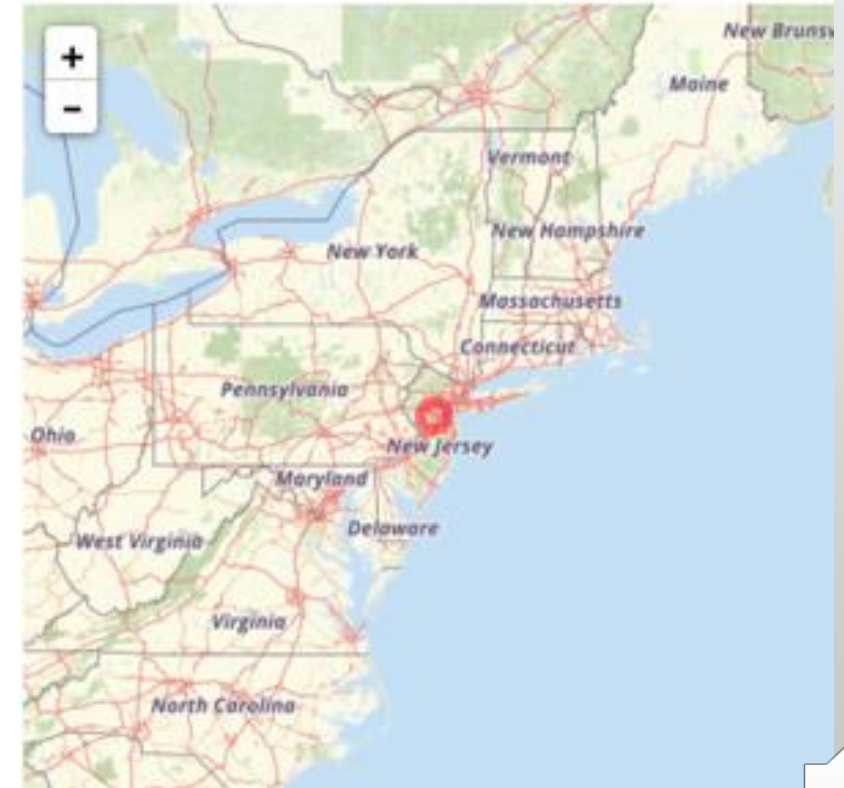
ISP: Rutgers University

Organization: Rutgers University

Services: None detected

Postal Code: 08873

Geolocation Map

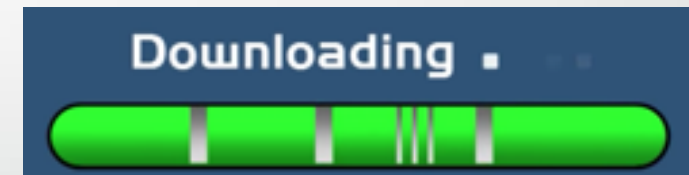


TCP / IP Protocols

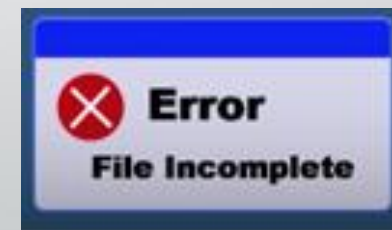
- **TCP** and **UDP** are protocols governing how traffic should be sent
 - Transmission Control Protocol
 - CONNECTION oriented protocol (sender – receiver acknowledge connection)
 - User Datagram Protocol.
 - CONNECTIONLESS (fire and forget protocol)



TCP



without TCP—missing data



UDP



Fire and Forget!



TCP/UDP

- TCP and UDP are protocols governing how traffic should be sent

TCP	UDP
Keeps track of lost packets. Makes sure that lost packets are re-sent	Doesn't keep track of lost packets
Adds sequence numbers to packets and reorders any packets that arrive in the wrong order	Doesn't care about packet arrival order
Slower, because of all added additional functionality	Faster, because it lacks any extra features
Requires more computer resources, because the OS needs to keep track of ongoing communication sessions and manage them on a much deeper level	Requires less computer resources
Examples of programs and services that use TCP: - HTTP - HTTPS - FTP - Many computer games	Examples of programs and services that use UDP: - DNS - IP telephony - DHCP - Many computer games



Internet and the WWW

more protocols



HTTP/HTML protocols



HTTP/HTML protocols



- Communication between clients and servers is done by **requests** and **responses**:
- A client (a browser) sends an **HTTP request** to the web
- A web server receives the request
- The server runs an application to process the request
- The server returns an **HTTP response** (output) to the browser
- The client (the browser) receives the response



HTTP/HTML protocols



- The client (the browser) receives the response along with COOKIE data (a small file stored on your computer)
- Next time you go to that webpage, your browser will attach that file to your request so that you may not have to login.



HTTP/HTML protocols



- In standard HTTP, information is sent in clear text.
- In HTTPS, information is encrypted. (Secure HTTP-encrypted information)



HTML

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction
Help:
About Wikipedia
Community portal
Recent changes
Contact page

Tools
What links here
Related changes
Upload file
Special pages
Permanent link
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Edit links

From Wikipedia, the free encyclopedia

This is a list of **notable sandwiches**. A sandwich is a dish consisting of two or more slices of bread with one or more fillings between,^[citation needed] or one slice in the case of an *open sandwich*. Sandwiches are a common type of lunch food often eaten as part of a *packed lunch*. There are many types of sandwiches, made from a diverse variety of ingredients. The sandwich is the namesake of John Montagu, 4th Earl of Sandwich, a British statesman.

Name	Image	Origin	Description
Bacon		United Kingdom	Often eaten with ketchup or brown sauce.
Bacon, egg and cheese		United States	A breakfast sandwich, usually with fried or scrambled eggs.
Baked bean		United States	Canned baked beans on white or brown bread, sometimes with butter.
Bánh mì		Vietnam	Filling is typically meat, but can contain a wide range of foods, including sardines, tofu, pâté, or eggs. Served on an airy baguette with pickled carrots, cilantro and peppers.
Barbecue		United States	Served on a bun, with chopped, sliced, or shredded meat (pulled pork, beef, or chicken typically), and sometimes topped with coleslaw.
Barros Jajpa		Chile	Ham and cheese, usually mantecoso, which is similar to farmer cheese.
Barros Luco		Chile	Beef (usually thin-cut steak) and cheese.

<HTML> TAGS:

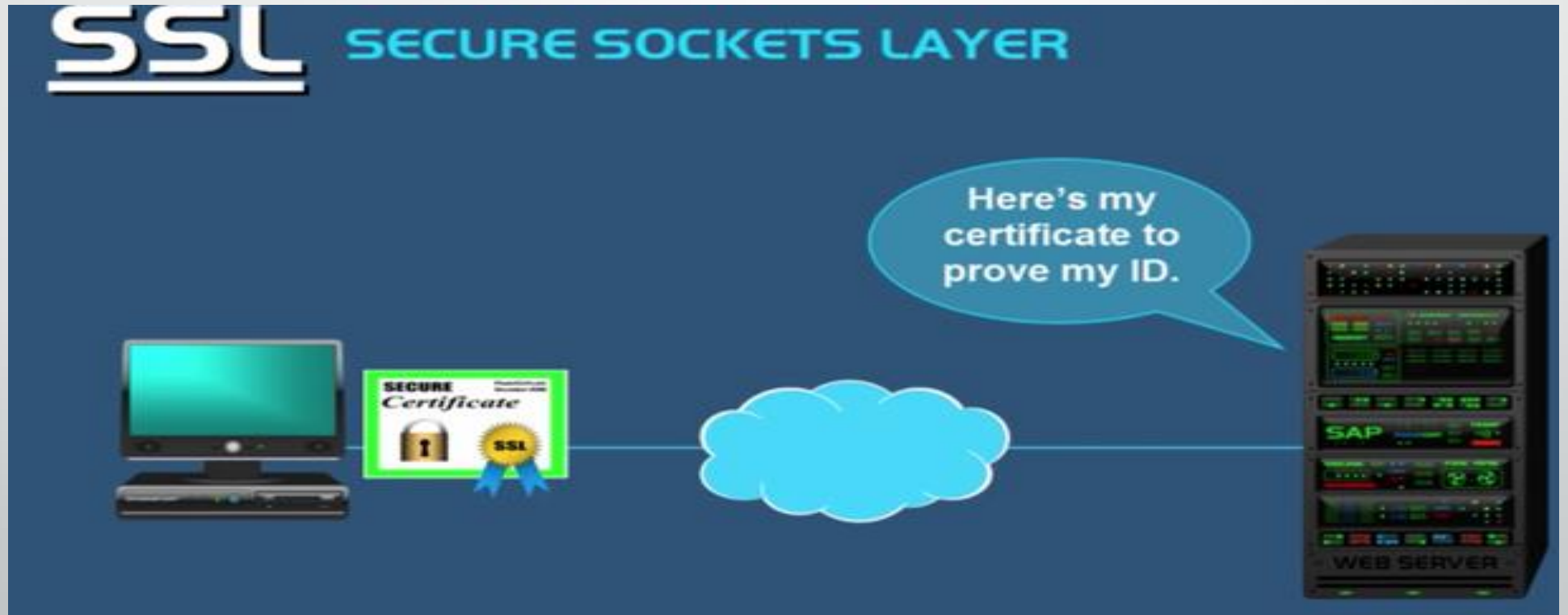
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SSL/TLS Protocols



SSL



TLS

TRANSPORT LAYER SECURITY

The latest industry standard cryptographic protocol.

The successor to SSL.

Authenticates the server, client, and encrypts the data.





A lot of websites are now using HTTPS by default, regardless if sensitive data is going to be exchanged or not.

Google is flagging websites as “not secure” if they are not SSL protected.

Google is penalizing websites that are not SSL protected.



Summary

- Protocols
- IP
- TCP/UDP
- SSL/TLS
- HTTP/HTTPS/HTML



Resources

- Videos
 - The Internet: IP Addresses & DNS: <https://www.youtube.com/watch?v=5o8CwafCxnU>
 - HTTP/HTTPS/SSL: <https://www.youtube.com/watch?v=hExRDVZHhig>
 - TCP/UDP: <https://www.youtube.com/watch?v=uwoD5YsGACgs>
 - The Internet: HTTP-HTML: <https://www.youtube.com/watch?v=kBXQZMmiA4s>

CS Unplugged Activities

Other resources:

- IP-Mailing Systems: <https://www.keithrozario.com/2013/09/what-is-it-ip-address.html>
- UDP-TCPL <https://www.homenethowto.com/ports-and-nat/udp-and-tcp-two-ways-of-sending-traffic/>
- IP address-Domain name <https://whatismyipaddress.com/>



Networks and the Internet-Part 2
Thanks for joining me!
Next up: The Internet-Data-Our Privacy!

- Have FUN!!!!

- Fran Trees (fran.trees@cs.rutgers.edu)

