Management Information Systems MIS 310

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The Internet and Telecommunications

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What is The Internet?

The History of the Internet

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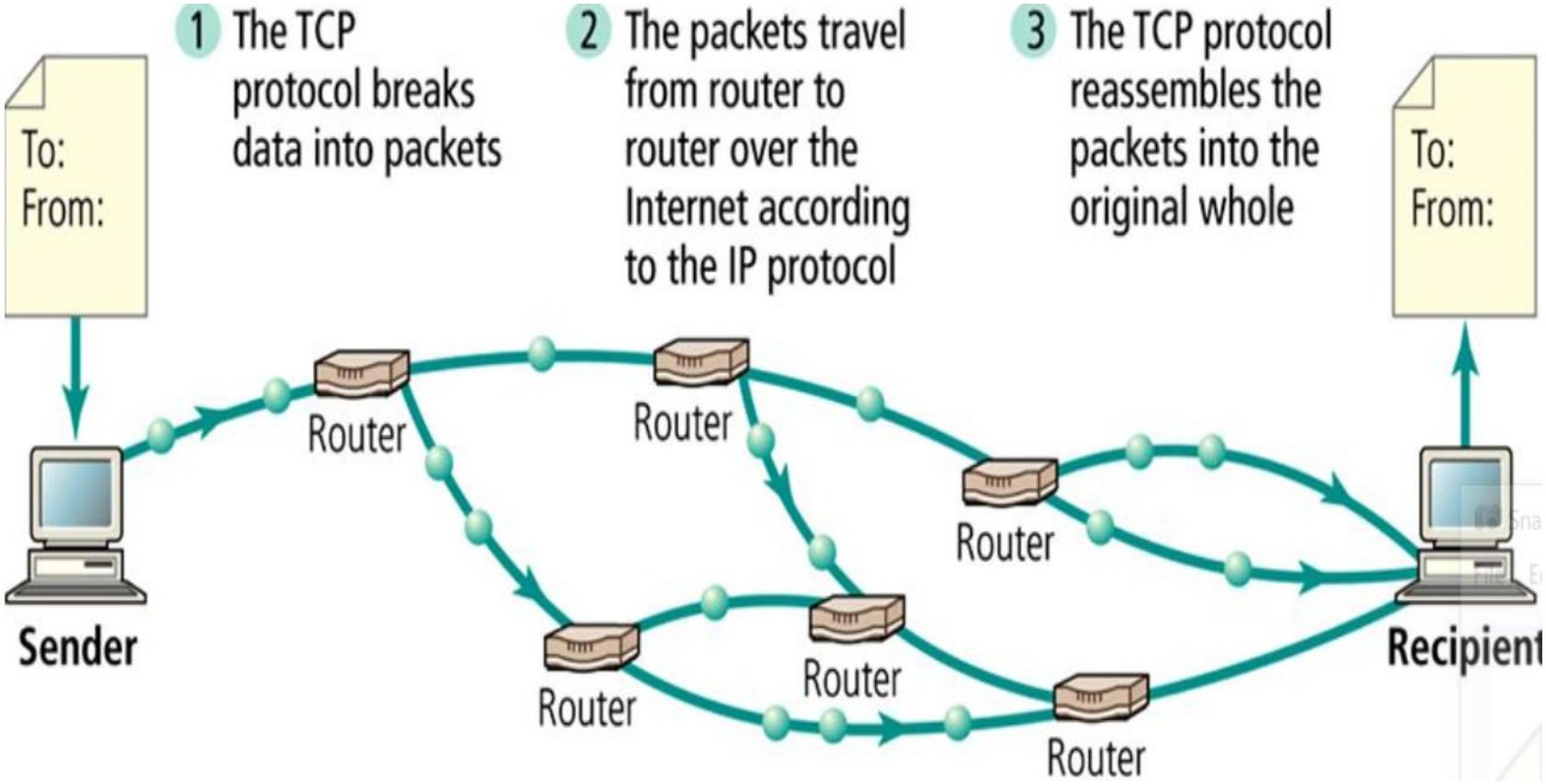
What is The Internet?

- Who is a narrator in the video?
- What project started the internet?
- What was the goal of this project?
- What was the solution?
- Who owns the internet?
- What is internet made of?

The Internet, Packets and Routing

- **The Internet** is a large worldwide collection of networks that use a common protocol to communicate with each other
  - The Internet is based on internetworking, or combining networks to form larger networks
- **Packets** or datagrams: Unit of data forwarded by a network.
  - All internet transmissions are divided into packets
  - Transmission control protocol (TCP) is used to disassemble and reassemble packets
- Data is transmitted by *packet switching* using the routing **Internet Protocol** (IP)
- **Packet switching** – process of moving packets from one node (computer device) to another

Routing Internet Messages



The Internet: Packets, Routing & Reliability

The Internet, Packets and Routing

- At the sender, data is broken into packets and sent to the nearest node (router)
  - **Routers**: Computing device that connects networks and exchanges data between them
- At each router, it sends the packet to another router that is closer to the final destination
- At the receiver, packets are reassembled to get the original data
  - A simple analogy: mailing system

TCP/IP: The Internet's Secret Sauce

- **IP** (Internet protocol): Routing protocol that is in charge of forwarding packets on the internet.
  - moving packets as quickly as possible from one router to another
  - doesn't check whether packets are delivered successfully
- **TCP** (Transmission control protocol): Works at both ends of internet communication to ensure a perfect copy of a message is sent.
  - disassemble/reassemble packets, error checking

Overview Questions

- What is the Internet?
- What is packet switching?
- What is a primary function of the IP protocol?
- Which protocol is used for error checking?

Internet and World Wide Web

- The World Wide Web, commonly known as the WWW and the Web, is an information space where documents and other web resources are located
  - Identified by Uniform Resource Locators (URLs),
  - Interlinked by hypertext links
  - Accessible via the Internet
  - Tim Berners-Lee invented the World Wide Web in 1989.

World Wide Web

- The World Wide Web is a system of interlinked hypertext documents on the Internet
  - Web servers
    - Provides access via a Web site
  - Web pages
    - Documents containing HTML (JavaScript)
    - **HTML** - the language understood by Web browsers
  - Web browsers
    - Provides interface to Web pages
  - Web protocols
    - **HTTP** - communication protocol used to process requests from Web browsers.

[The Internet: HTTP & HTML]

World Wide Web And Addresses

- **Uniform Resource Locator** (URL) is used to identify and locate a Web page
  - Exact location of the document
  - The method or protocol to retrieve and display the document
- Web Site address
  - **Application transfer protocol** is a set of rules for communication
  - **Host and domain names**: A domain name represents an organization. Hosts are public services offered by that organization
  - **Path and filename:** The path maps to a folder location where a file is stored on the server; and the file is the name of the file a user is looking for.

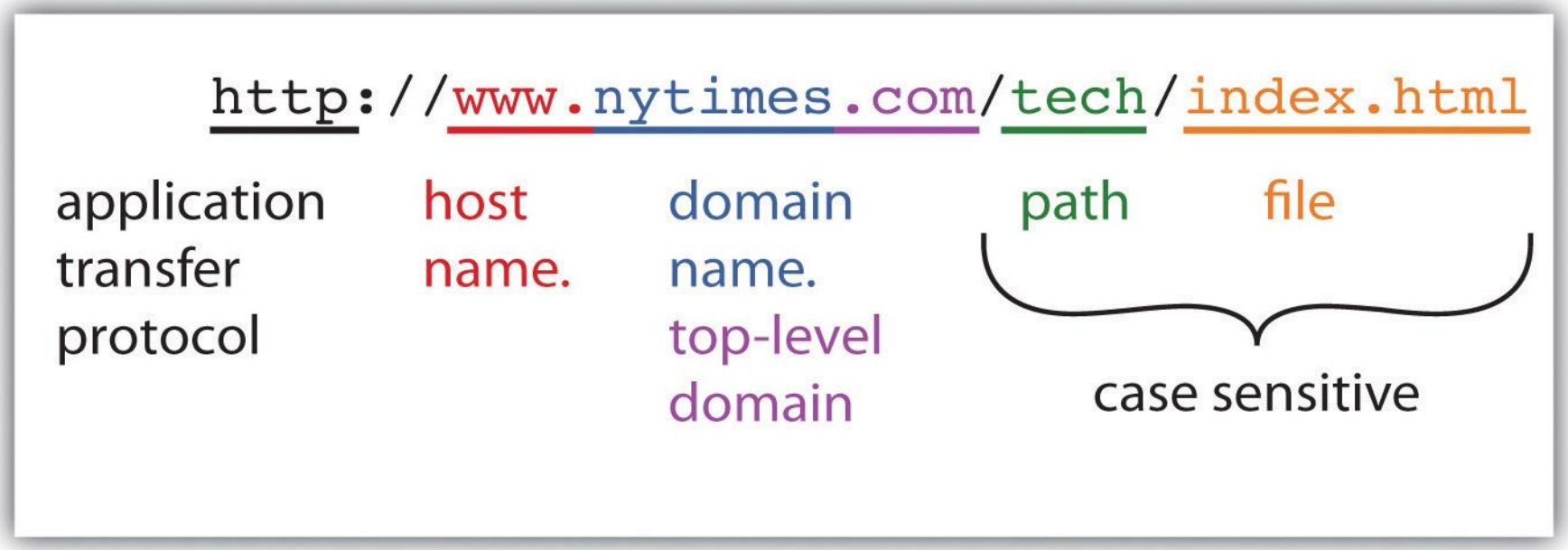
Domain Name and IP Addresses

- **Domain Name** refers to the website address
- **IP Addresses**: Numeric value used to identify a device that is connected to the Internet
  - IPv4: Old style, 32-bit, running out of addresses
  - IPv6: New style, 128-bit, huge address space
  - The IP address is an actual set of numerical instructions.
  - Can be used to identify a user's physical location
- The WWW translates domain names into IP addresses
  - The domain name functions as a link to the IP address.
    - www.arizona.edu translates to (IPV4) 128.196.134.37
  - A URL could be expressed directly as an IP address, although it's more common to use it's related domain name
- **The Domain Name Service** (DNS): Distributed database that looks up host and domain names and returns the actual IP address.
  - **Nameservers:** Find Web servers, e-mail servers, and more.
  - **Cache:** Temporary storage space.

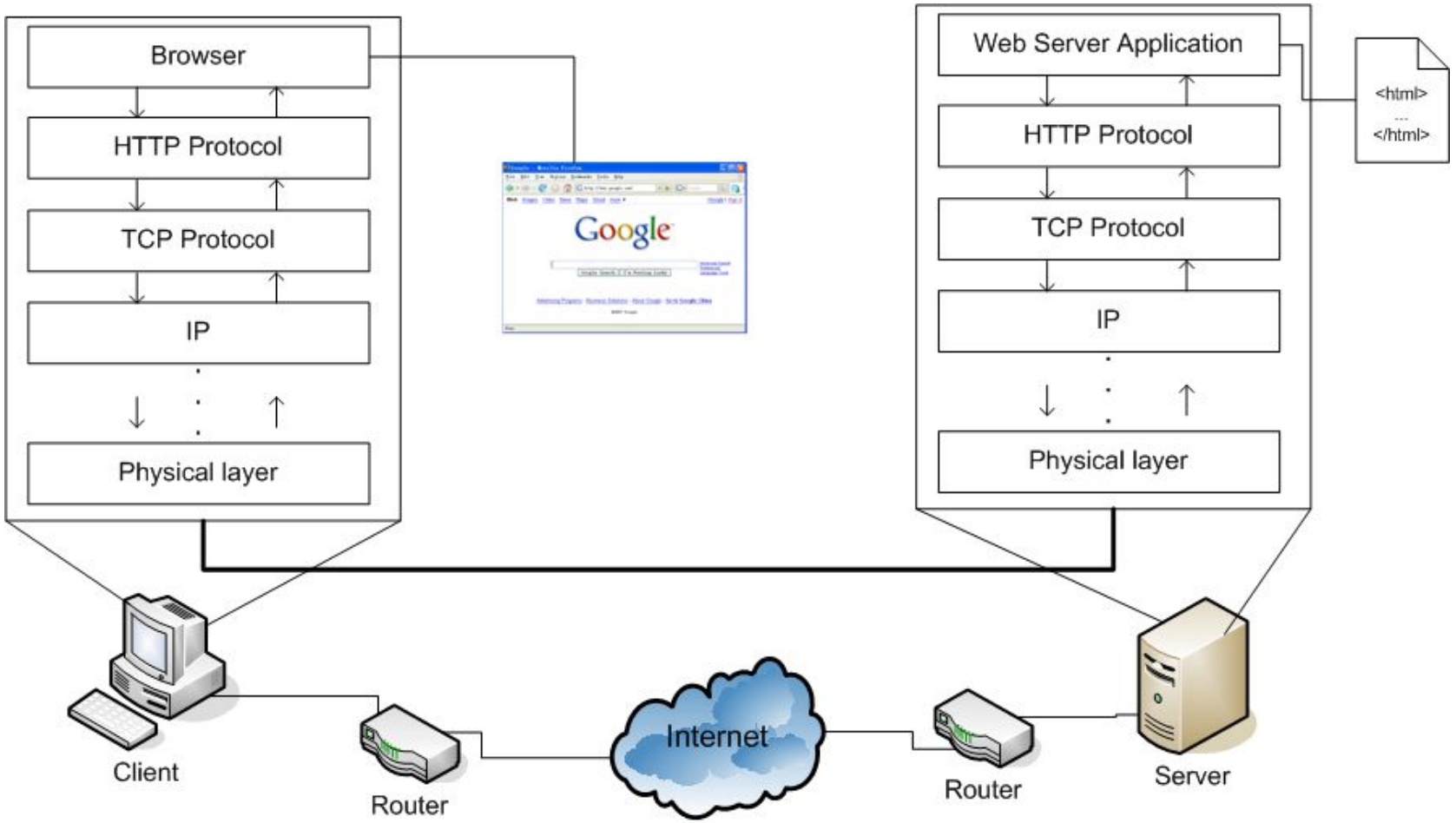
Web Domain Names

- Domain name registration
  - Pay a registrar for the right to use that name, with the right renewable over time.
- Web hosting
- Internet Corporation for Assigning Names and Numbers (ICANN)
  - A nonprofit governance and standards-setting body that accredits registrars throughout the world
- Cybersquatting
  - Knowingly registering a domain name in order to profit from someone else's firm name or trademark is illegal

World Wide Web And Addresses



World Wide Web Architecture



Overview Questions

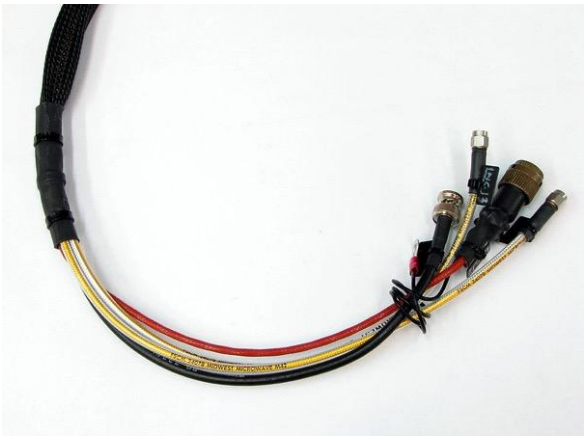
- What is the difference between HTML and HTTP?
- What is the difference between a web page and a web browser?
- What is the difference between IP address and domain name?
- How is URL used?
- What is a domain name in the following address?
  - *https://www.csuci.edu/student-life/*

Last Mile: Faster Speed, Broader Access

- **Internet backbone**: High-speed data lines that interconnect and collectively form the core of the Internet.
- **Amdahl's Law**: System's speed is determined by its slowest component.
- **Last mile problem**: Internet connections are the slowest part of the network.
  - Last Mile: Technologies that connect end users to the Internet
  - Broadband: High-speed Internet connections.
  - Bandwidth: Network transmission speeds that are expressed in some form of bits per second (bps).

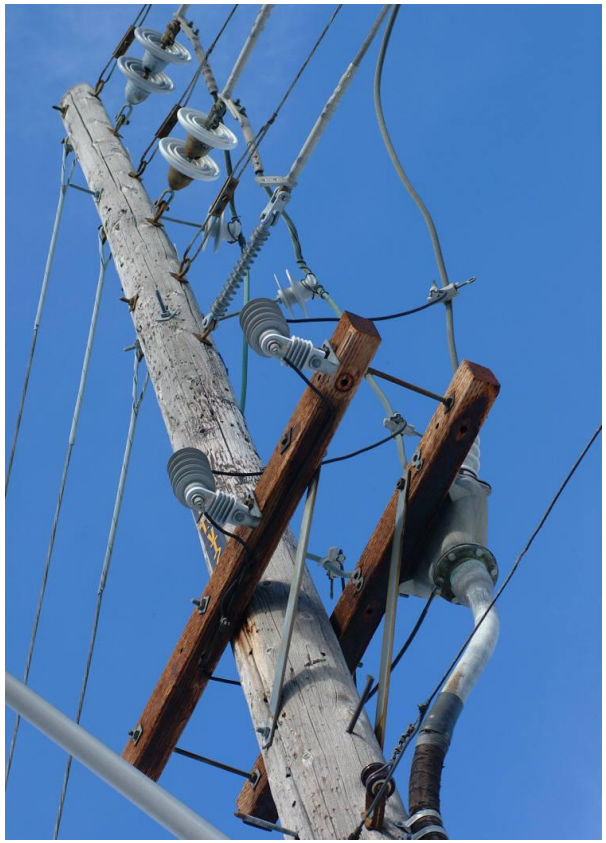
Last Mile: Cable Broadband

- Thick copper wire to offer broadband access.
  - Coaxial cable: Insulated copper cable used by television providers.
  - Has shielding that reduces electrical interference.
  - Allows cable signals to travel longer distances without degrading and with less chance of interference.
- Limitation:
  - Requires customers to share bandwidth with neighbors



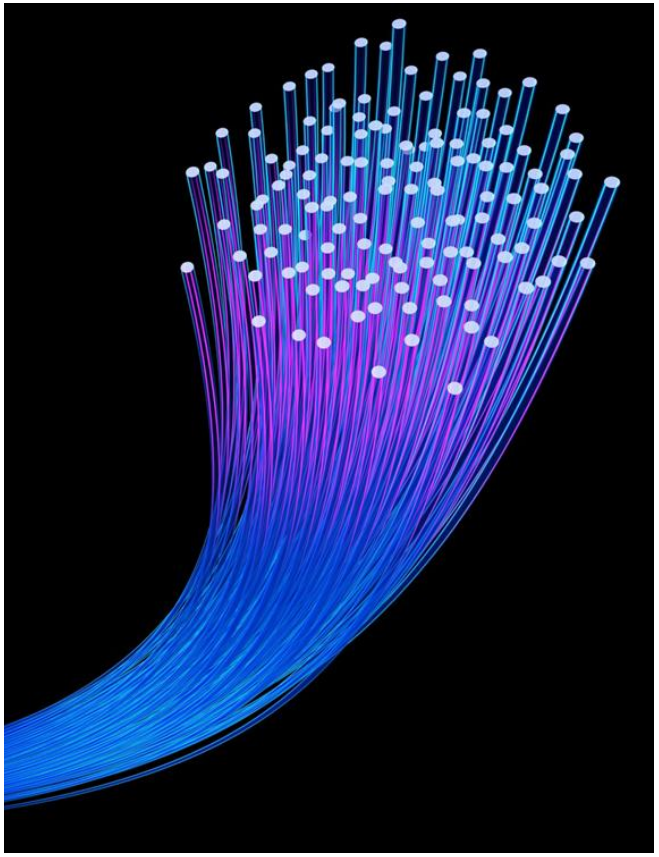
Last Mile: Digital Subscriber Line

- DSL
  - Broadband technology that uses the wires of a local telephone network.
  - Speeds vary depending on the technology deployed.
- Limitation:
  - Uses standard copper telephone wiring that lacks the shielding used by cable.
  - Pricier and less practical than alternatives.



Last Mile: Fiber To The Home

- FTTH
  - Broadband service provided via light-transmitting fiber-optic cables.
  - Fastest last-mile technology and works easily over long distances.
- Limitations:
  - Need to build fiber infrastructure from scratch.
  - Cost of building is enormous.



Last Mile: Wireless

- Mobile wireless
  - Service from cell phone access providers is delivered via cell towers.
- Providers require a wireless spectrum.
  - Wireless spectrum: Electromagnetic frequencies used for communication.
  - Most mobile cell phone services have to license spectrum.

Usage	Demand
Voice Calls	4 MB/hr.
iPhone Browsing	40–60 MB/hr.
Net Radio	60 MB/hr.
YouTube	200–400 MB/hr.

Conventional mobile phones use an estimated 100 MB/month, iPhones 560 MB/month, and iPads almost 1 GB/month.

Average Demand Source: Based on information from R. Farzad, "The Truth about Bandwidth," BusinessWeek, February 3, 2010.

Last Mile: Satellite Wireless

- Terrestrial wireless
  - Provided by earth-bound base stations like cell phone towers.
- Via Satellites
  - Satellites in geosynchronous earth orbit (GEO) circle the earth in stationary orbit above a given spot on the globe.
- O3b Initiative is a leader in this space
  - Provide fiber-quality wireless service to more than 150 countries, targeting underserved nations.
  - Provide connectivity outside traditional cell networks (cruise ships, the U.S. Navy)

Last Mile: Wi-Fi and other Hotspots

- Wi-Fi: Wireless local-area networking devices
  - Stands for wireless fidelity.
  - Wi-Fi antennas are built into their chipsets.
  - To connect to the Internet, a device needs to be within range of a base station or hotspot.
- Wi-Fi base stations used in the home are usually bought by end users.
  - They are then connected to a cable, DSL, or fiber provider.
- Personal Hotspot
  - Wi-Fi equipped mobile devices
  - Connect to the Internet via the cell network
  - Allow nearby devices to also connect to the Internet.
- Bluetooth
  - Short-range wireless connectivity, to eliminate cabling