CMPT 165
Intro to Internet & WWW

May 13th 2015

Today's agenda

- Preliminaries
- Internet & its structure
  - Network devices: modems, router, etc.
- Learn few terms & concepts:
  - Client/Server communication
  - How data is transmitted over the internet
  - Connection and network types
  - IP address…

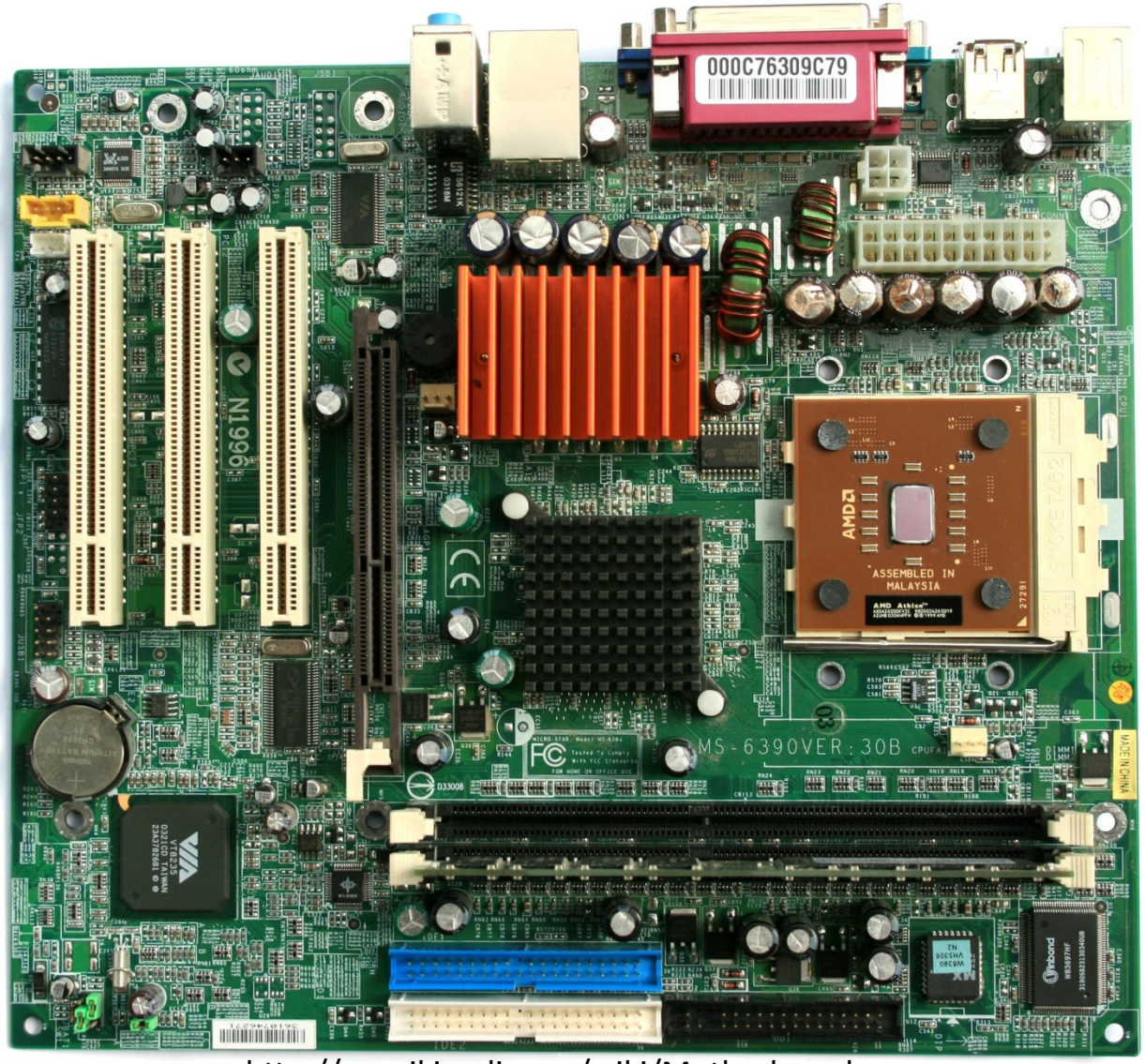
Preliminaries

Computer: device that is *programmed* to perform some operations *automatically*

Hardware: physical items that you buy at a store

e.g. motherboard, hard drive, memory card, etc.

Preliminaries



http://en.wikipedia.org/wiki/Motherboard

Preliminaries

http://en.wikipedia.org/wiki/Hard_disk_drive

Preliminaries

Computer: device that is *programmed* to perform some operations *automatically*

Hardware: physical items that you buy at a store

e.g. motherboard, hard drive, memory card, etc.

Software: instructions stored and run by hardware

- Types:
  - Application: Browser ("FireFox"), Word, PowerPoint, Paint, Acrobat Reader, Notepad++, …
  - System:
    - Operating system: e.g. OS X of Mac, Windows of PC
    - Devices drivers (for printer, monitor, scanners, etc.)
  - Malware: malicious software

Preliminaries

Data

- Computers do not read text like humans do
- They are programmed to interpret streams of "bits" only, e.g.

  … 00100010 00000110 11101011 …
- **Bits (binary digits)**: 2 states "binary"
- 8 bits = 1 byte → Example above: "3 bytes of data"

Memory storage

- **Physical**: data is stored permanently on device
  - E.g. Hard drive, USB  ➔ "local" storage
- **Virtual**: data is lost after computer is shut off

Modem: "modulator-demodulator"

- Encode/decode data for communication between devices
  - streams of bits → signals
  - signals → streams of bits

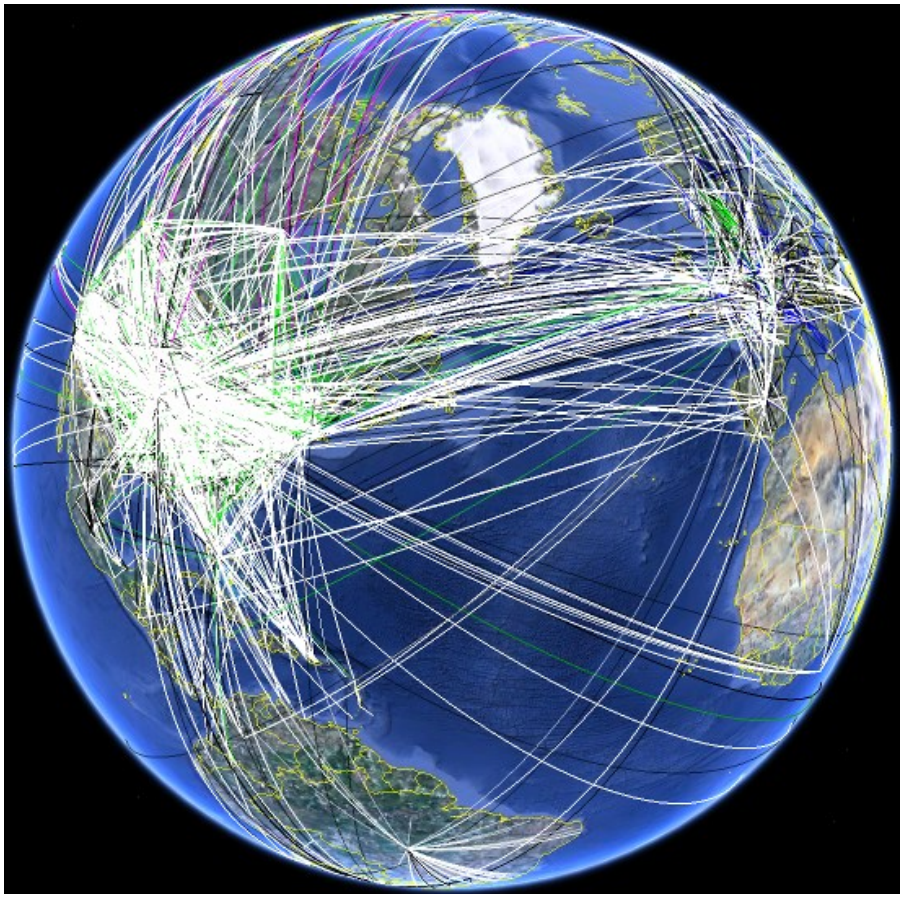
Preliminaries – Summary

- Hardware
- Software
  - Application software
  - Operating system
  - Malware
- Data
  - Bits
  - Bytes
- Memory storage
  - Virtual
  - Physical
- Modem

Intro to Internet & its structure

Internet

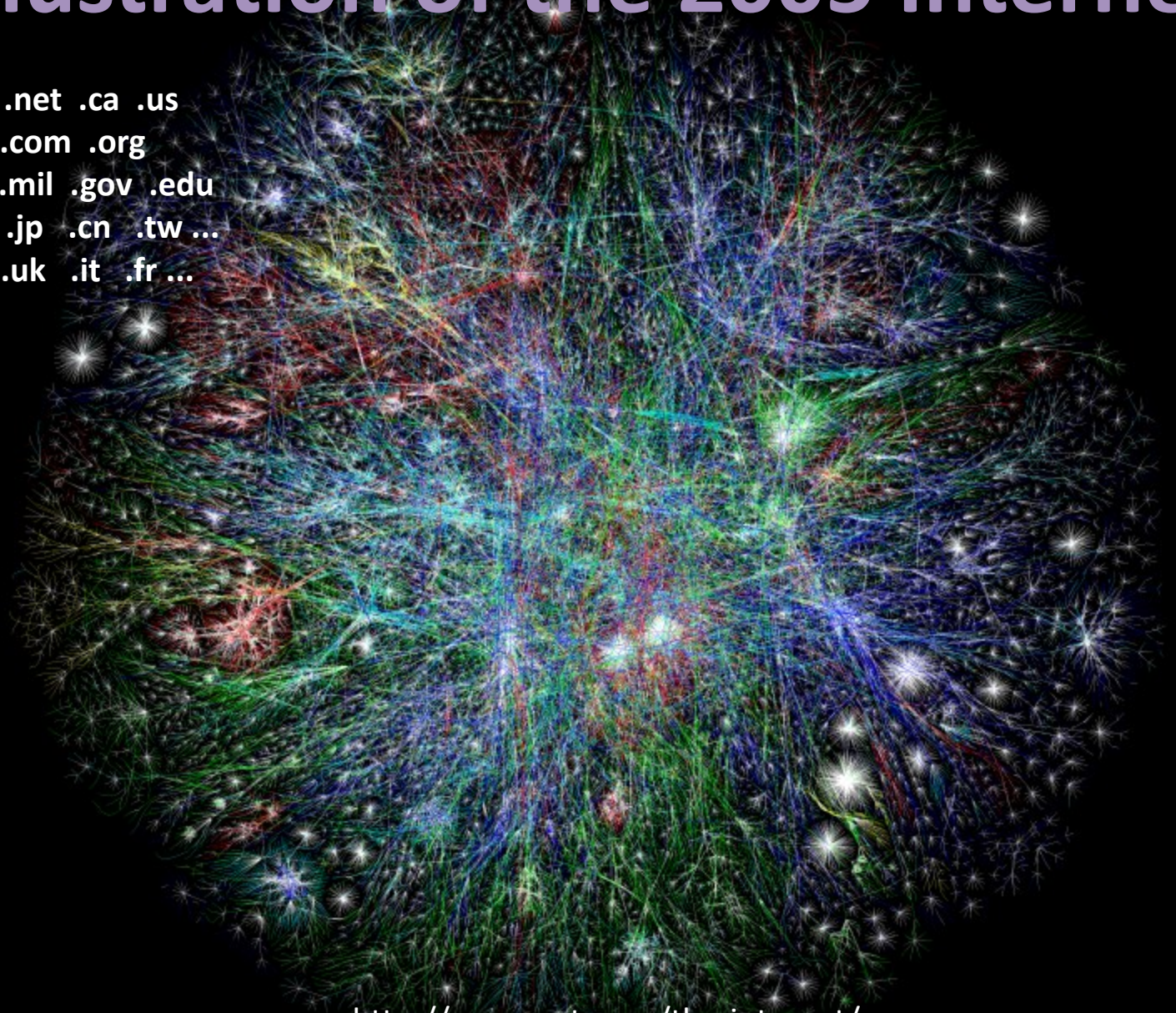
Inter-connected + network ➔ “Inter” + “network”



https://thesprawl.org/media/projects/opte2kml.png

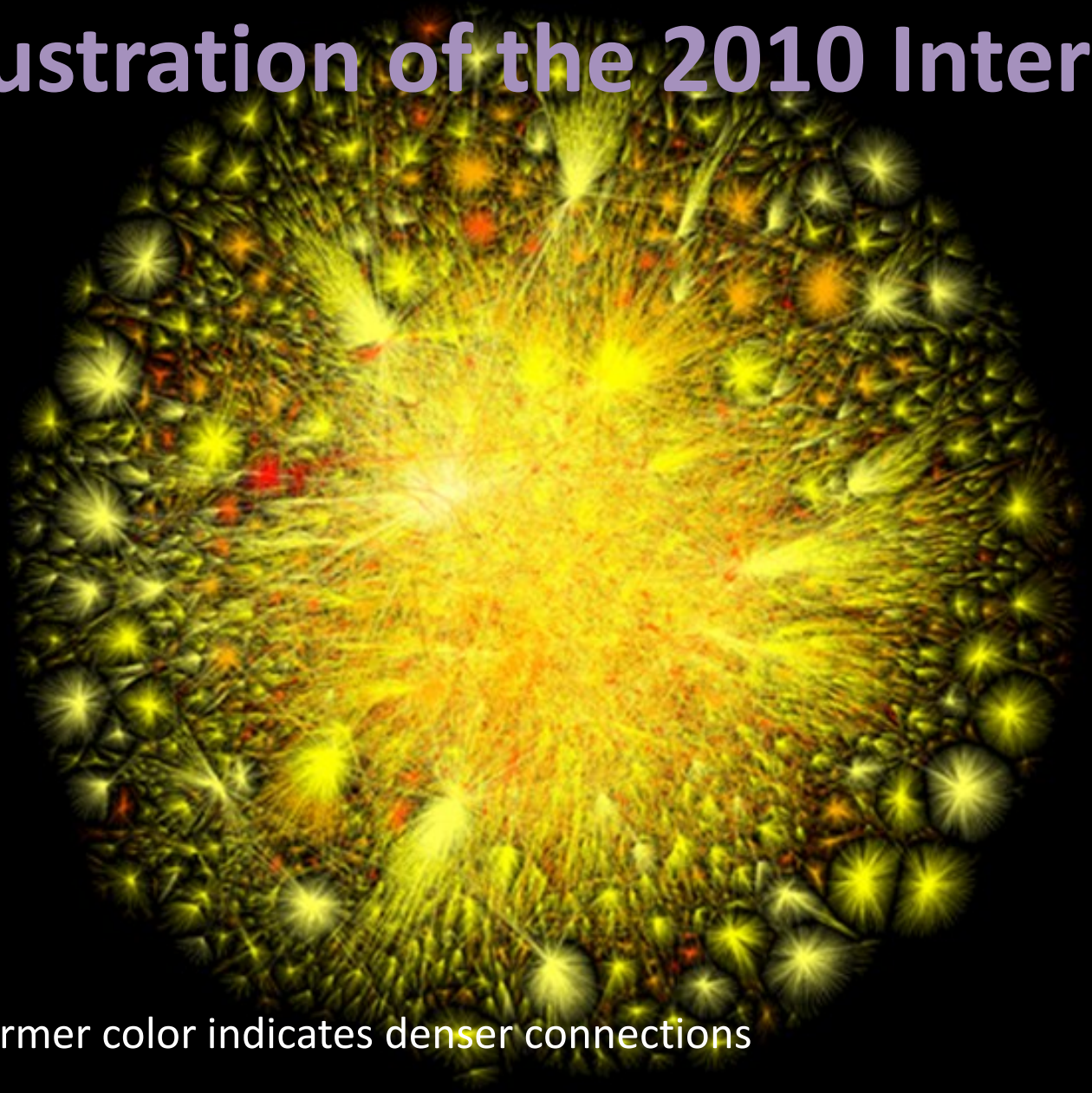
Illustration of the 2005 Internet

Dark blue: .net .ca .us
Green: .com .org
Red: .mil .gov .edu
Yellow: .jp .cn .tw ...
Magenta: .uk .it .fr ...
…



http://www.opte.org/the-internet/

Illustration of the 2010 Internet



➔ Warmer color indicates denser connections

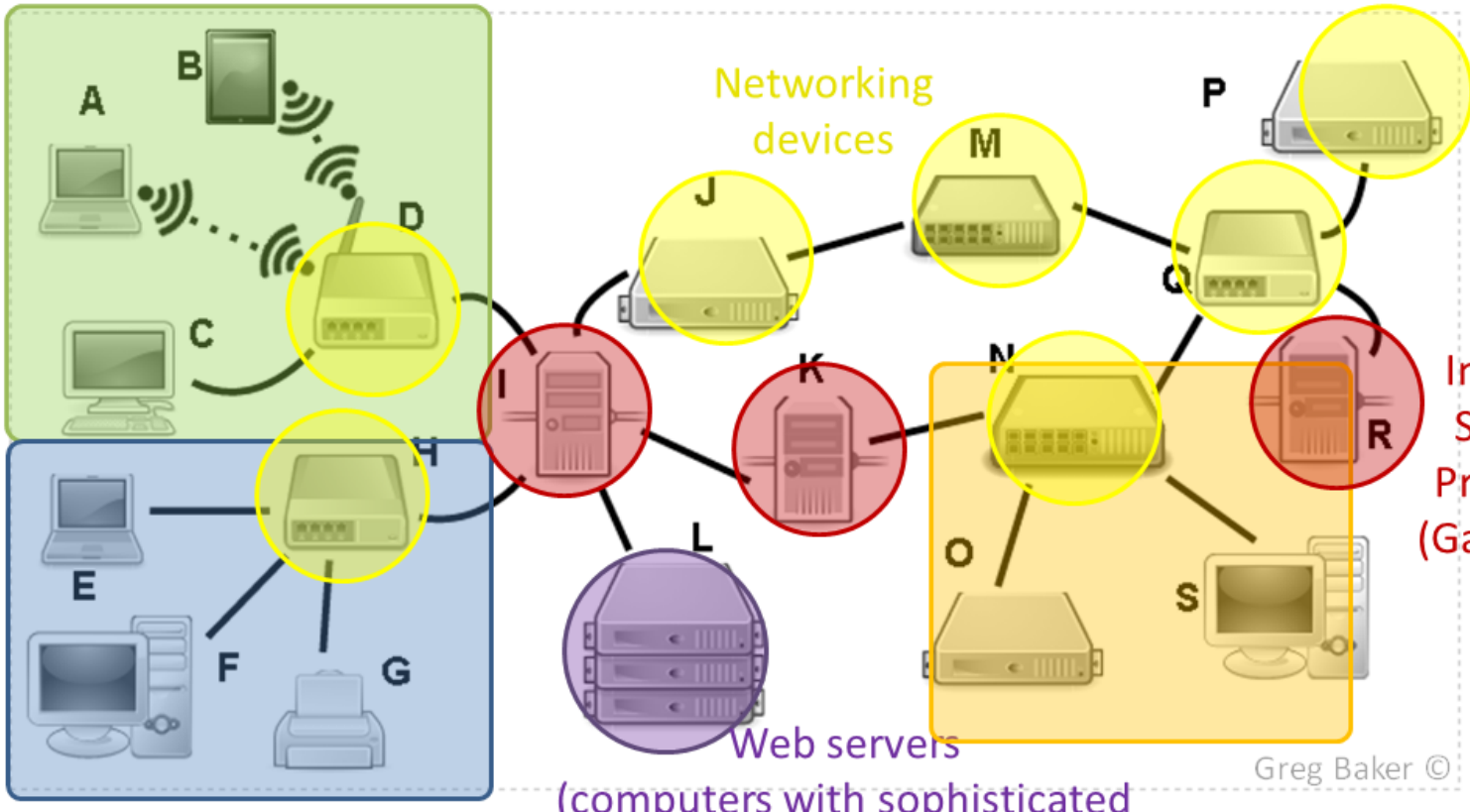
http://www.opte.org/the-internet/

Basic structure of internet

Home#1: consists of laptop, tablet, computer, router

Home#2: computer, …, modem

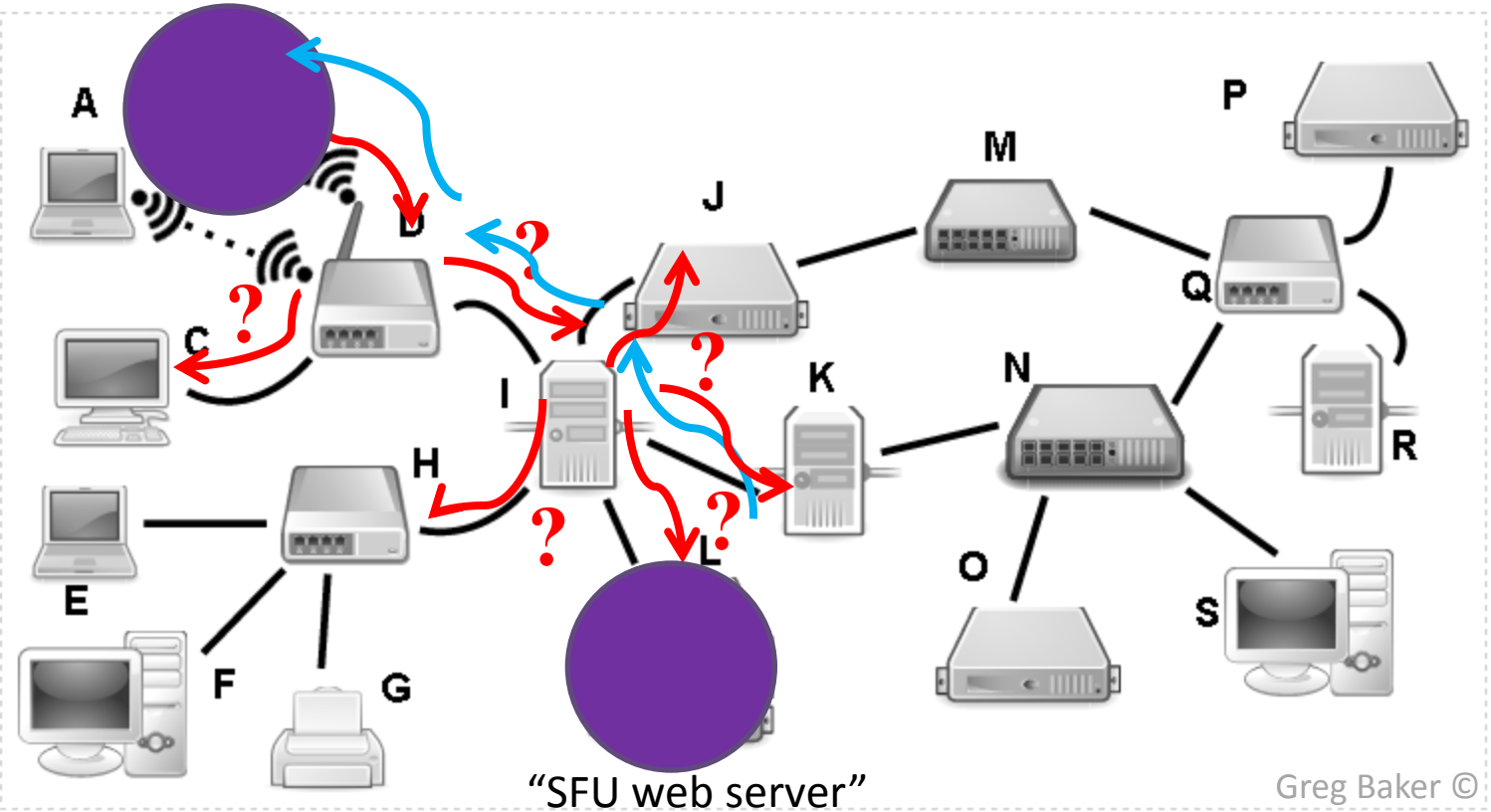
Home#3 (or office/lab): printer, …, modem



The data transmission process

Suppose you request to view the "www.sfu.ca" webpage on your tablet…

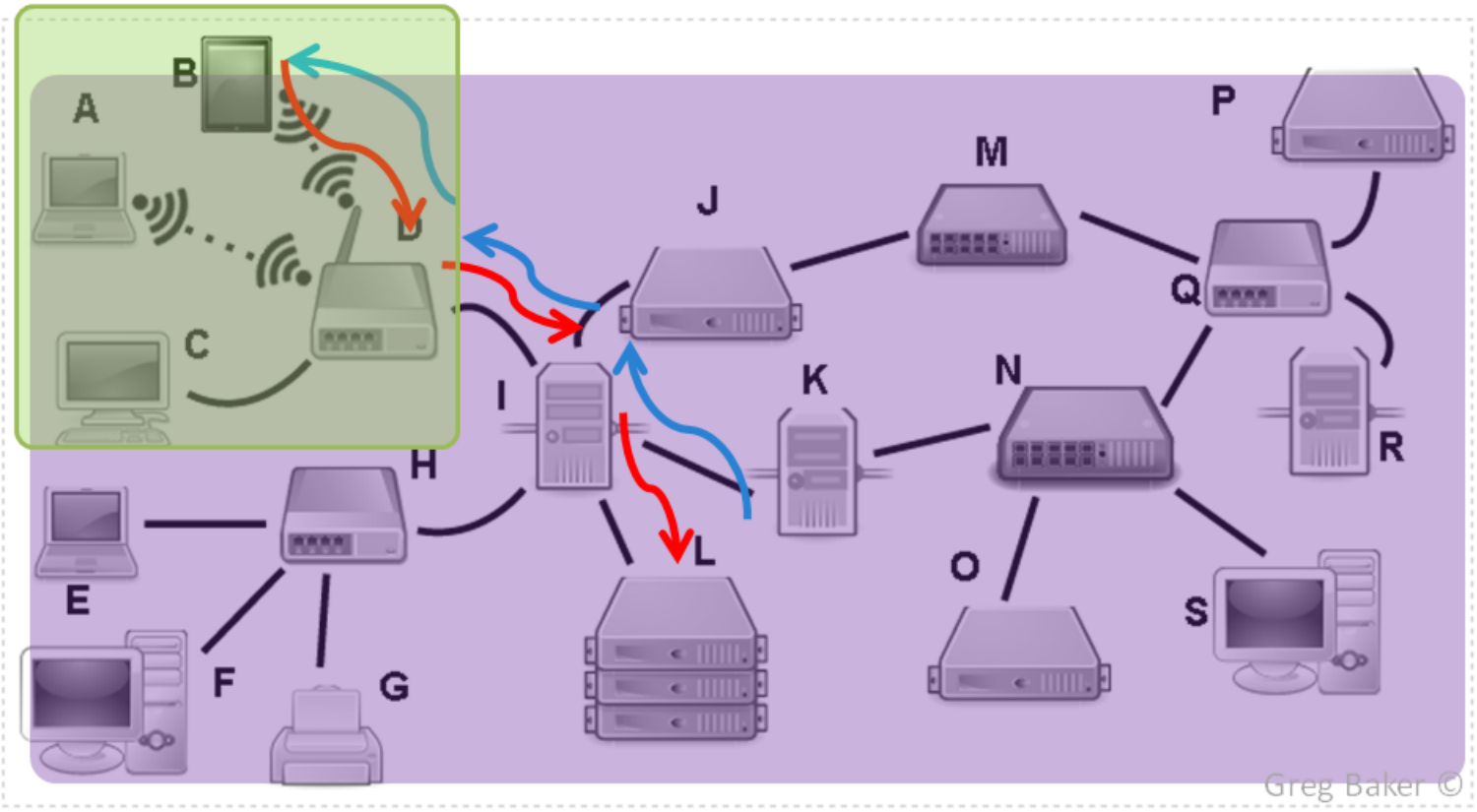
1. **Client (B):** requests the webpage for "www.sfu.ca"
2. **Networking device (D):** relays request to the correct path
3. **Server (L):** receives + processes request + send data back



Related Internet terminologies

Upload vs. download data

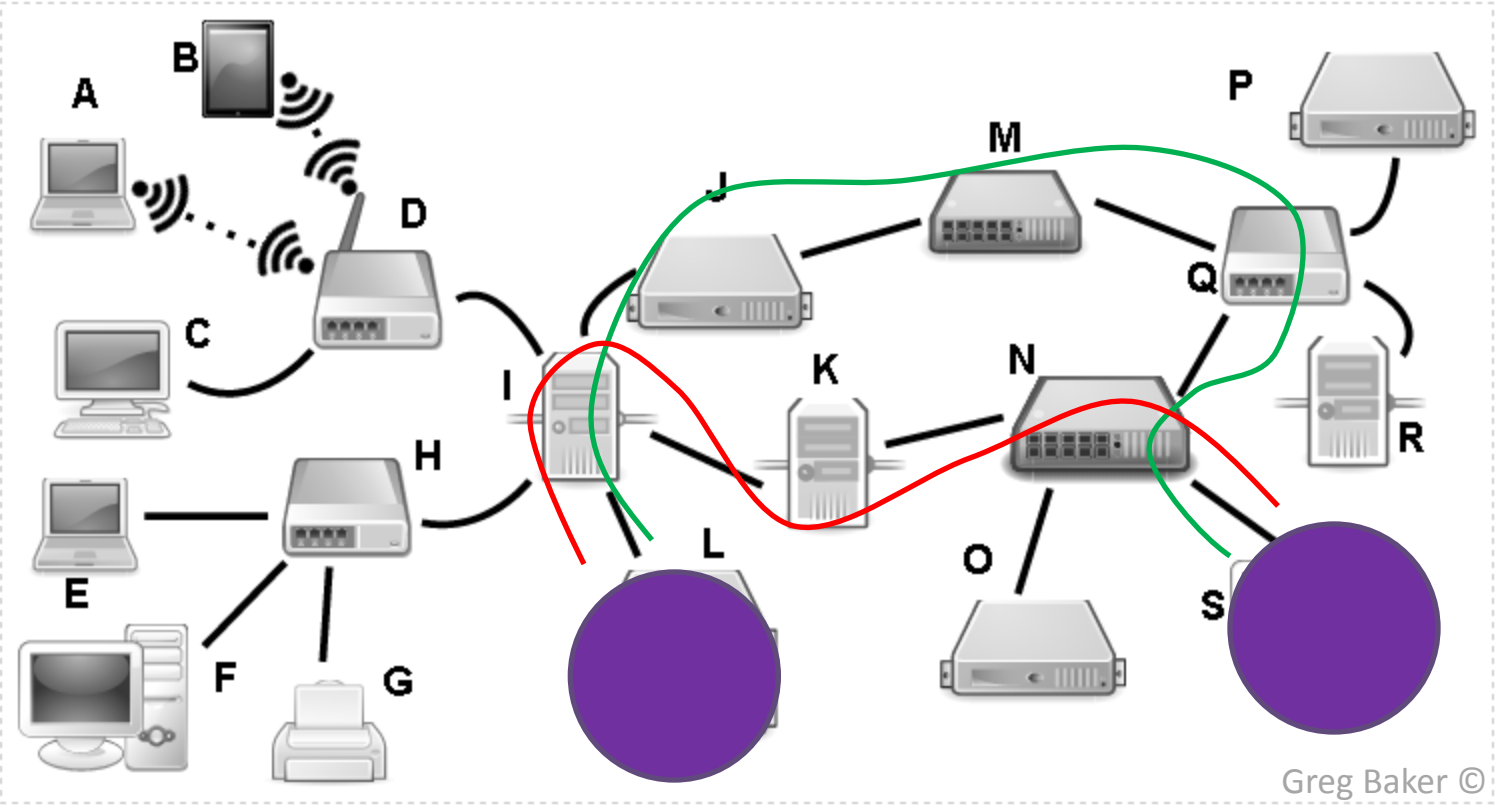
Local area network vs. wide area network



Networking devices

Devices L + S have 2 communication pathways

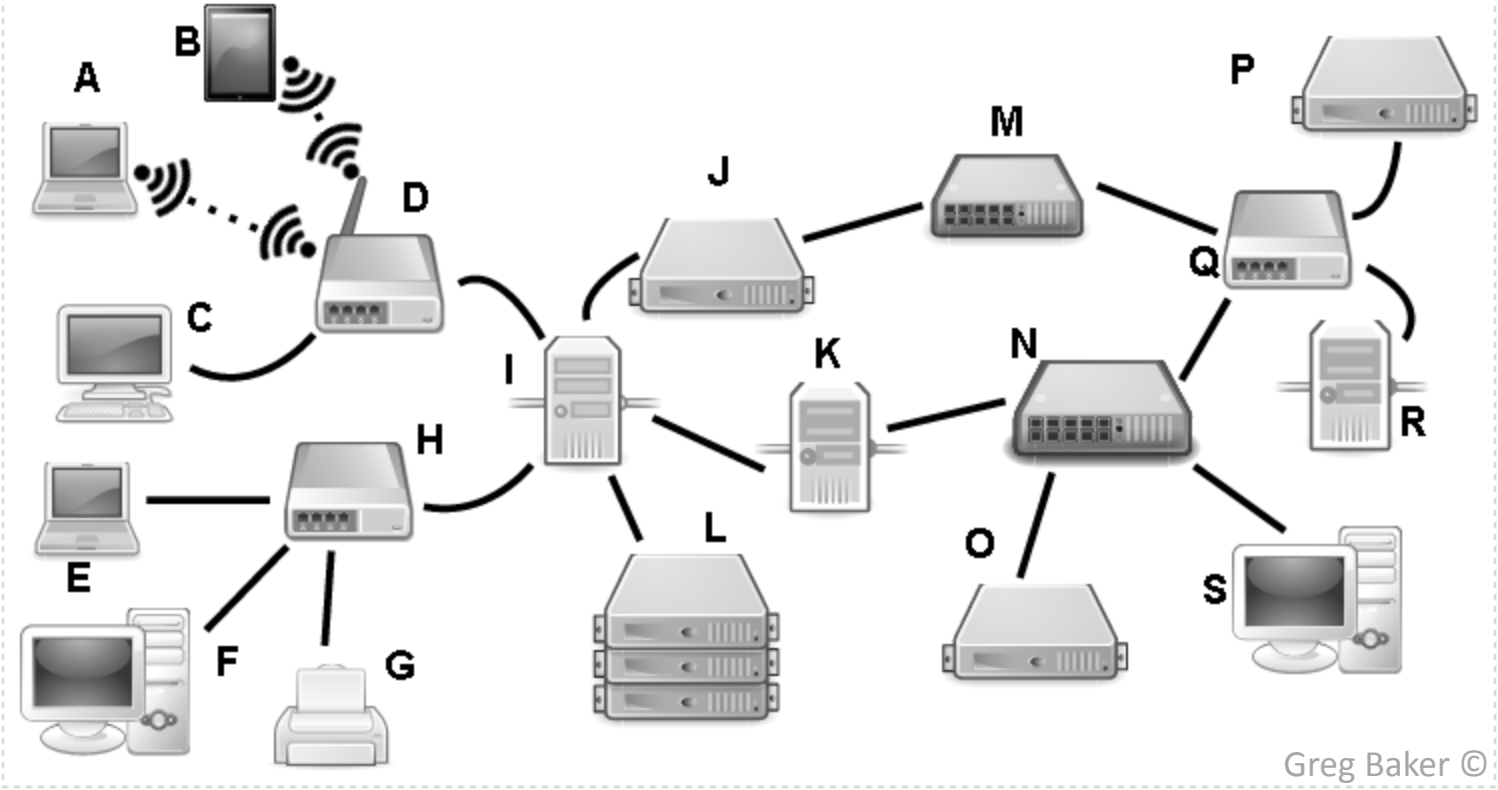
- Uses these devices to relay data so they go through “best” path
- E.g. Router, Hub, Switch



Common connection types

Wired:

Wireless:



Common connection types

Wired:

Ethernet: connects devices with wire

Dial-up: connects via phone line

→ Cannot surf while on phone

ADSL (Asymmetric Digital Subscriber Line): copper wire phone line

→ Faster than Dial-Up

→ Download faster than upload

TV cable

Wireless:

Wi-Fi "wireless fidelity" network

→ e.g. 802.11b, 802.11g

→ Radio waves to transmit data

Bluetooth

→ Radio waves of shorter wavelengths

→ Meant for shorter distances

…

Modem:

e.g. "001001" ←→ electrical signals

Wireless router:

"001001" ←→ radio wave signals

Other types of network

Mobile

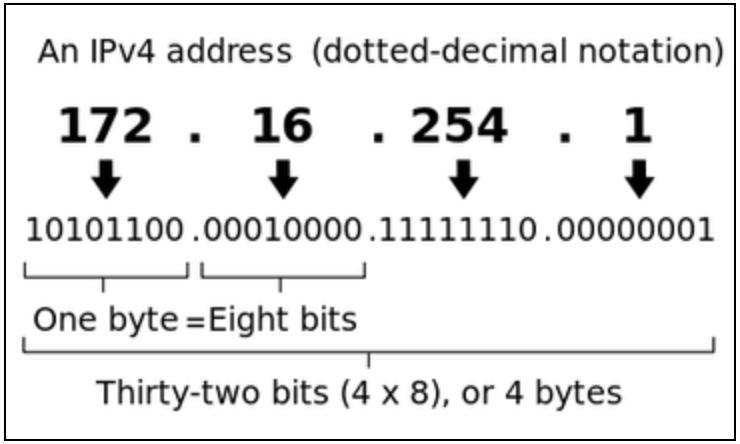
- Phones use either wifi or mobile network, if wifi N/A
- Data is transmitted wirelessly to phone towers
- Slowest to fastest: GSM, EDGE, 3G, HSPA, LTE

Fiber optic

- Strands of glass or plastic, slightly thicker than hair
- Transmit data as pulses of light
- Works very well even over long-distance

How to identify the right computer?

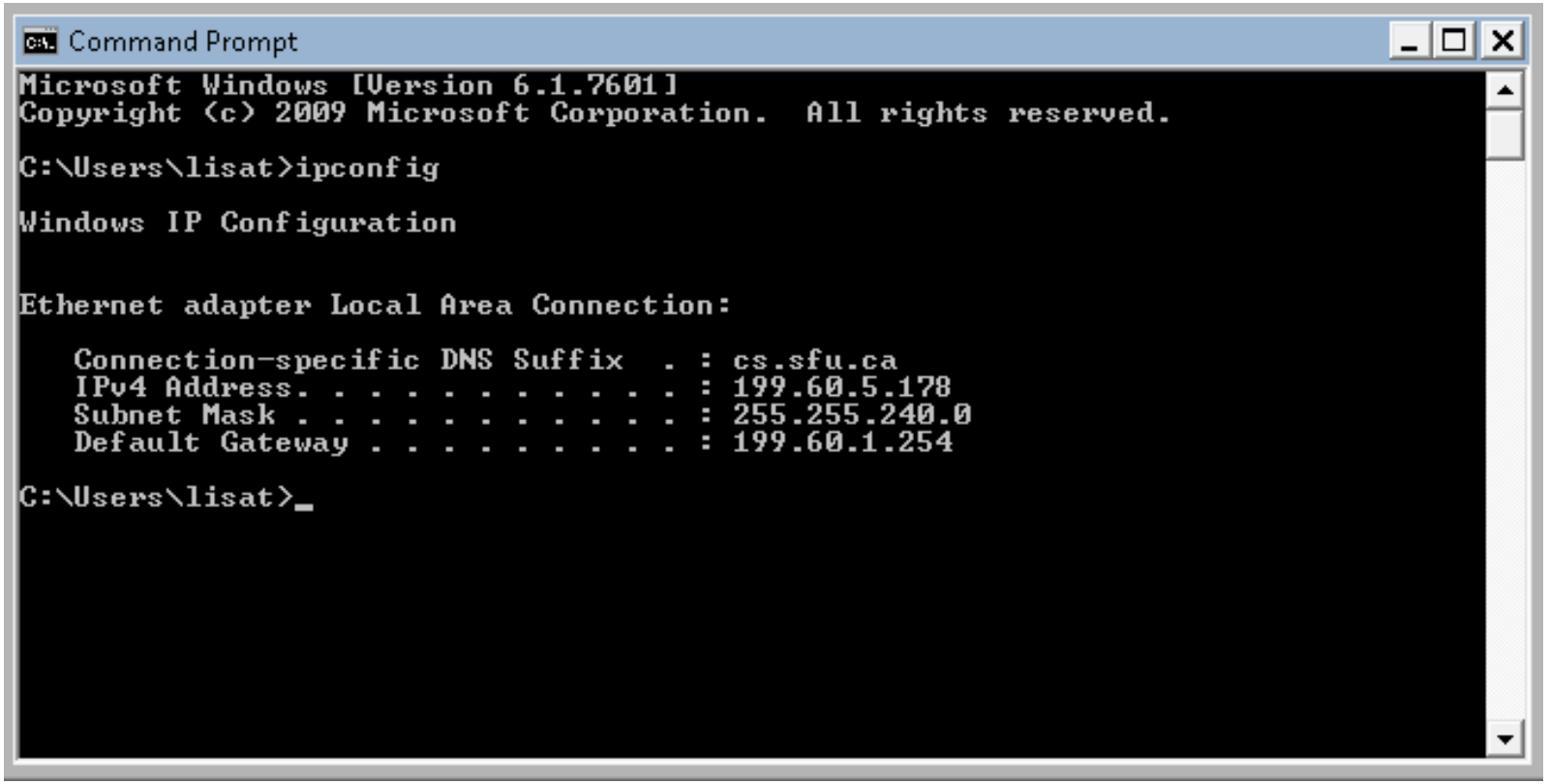
- IP (Internet Protocol) address
- IP system assigns each device to a unique identifier, e.g.



- Indicates: which, where it is, route to use
- Assignment types:
  - Dynamic: at home, by your ISP → not permanent
  - Static ones, e.g. www.sfu.ca

Try it yourself: find your computer's IP address…

- On Windows: Start → Accessories → Command Prompt ; then type "ipconfig"
- On Mac: open Applications → Utilities → Terminal; type in "ifconfig –a"
- On Linux: Terminal; type in "ifconfig"



Questions?