Personal File Structure

Computer Networking

History of networking

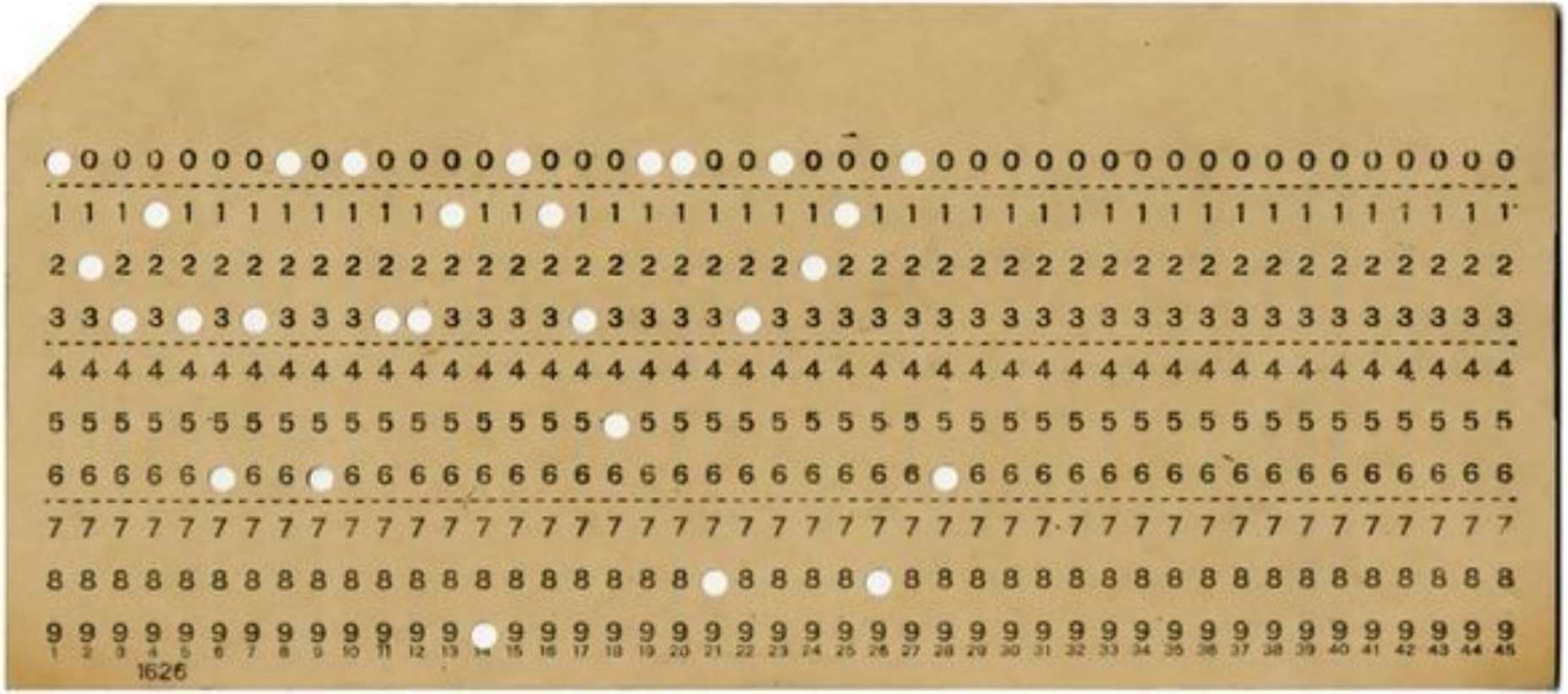
-pre 1970, most computers operated totally independently

-First computer networks came into being in the 50s, and 60s

    -these networks were local to a particular company, or institution such as a University

    -were used to transfer data between the institutions machines

-before this, people would have to carry a paper punch card, or a magnetic tape containing info, in order to get that info on another machine



https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.computerhistory.org%2Frevolution%2Fpunched-cards%2F2&psig=AOvVaw0YxwC-bc00BQEXRcKUjFmP&ust=1596747643311000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCOij3tL6hOsCFQAAAAAdAAAAABAE

alamy stock photo
JC776J
www.alamy.com

Benefits of networking

-Allows multiple machines to share information

Ex. sending files and data back and forth to each other

-Allows users to share equipment

Ex. instead of every computer having their own printer hooked up, all the workers in an office could send their documents to the same, communal printer.

Local Area Networks (LAN)

-can be as small as 2 computers and as large as thousands.

-locally connected computers with the ability to share information along a private local network specific to one building, or a small group of buildings

Ex. the computer lab at a school, two people connecting their computers to play video games locally together

Ethernet

-most common and successful local area network (LAN) technology

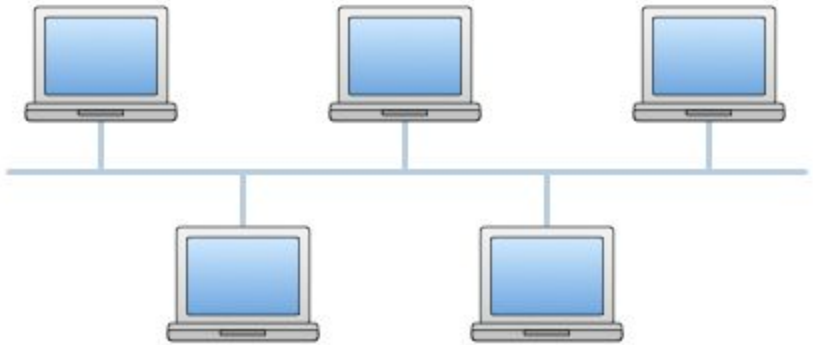
-developed in the 1970s, and is still used today

-Computers are connected by a shared ethernet cable

-computers write the data they want to share as an electrical signal which is sent through the cable

-Because the connection is shared, when one computer passes info along, all the other computers can see the transmission, but is unaware whether that info is meant for it.

Single Carrier System



So how does the computer know what info is intended for it?

Media Access Control (MAC) Address

-Ethernet requires that each computer has a unique MAC address which identifies them within the network

-When data is sent out, it is prefixed with a header that contains the MAC address of the destination computer.

-All computers listen, but will only read the data if its MAC address matches the one in the header

    -this process in general is known as Carrier Sense Multiple Access, or CSMA

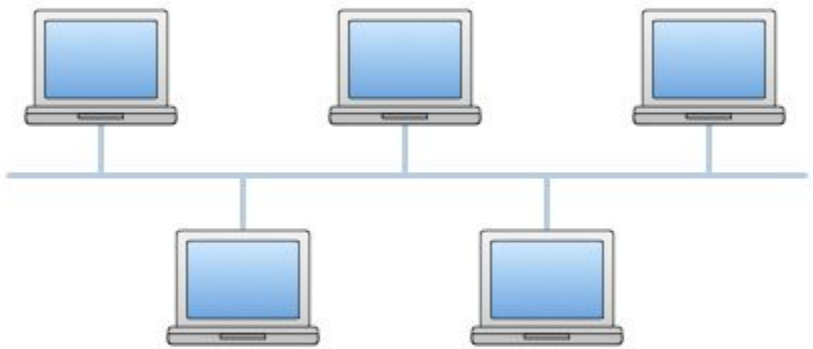
Carrier Sense Multiple Access CSMA

The carrier = The medium the info is being transported on (Wire for ethernet, the air for WIFI)

Sense, multiple access = multiple machines in the network can sense the carrier at one time.

The rate at which a carrier transmits data = Bandwidth

A Problem: What happens when two machines send data at the same time?



Collisions

-When two computers send out data on a shared carrier, we get a collision

-This leads to a scrambling of both signals, and the information won’t be properly transmitted

Possible Solutions

Just Wait?

-if a machine can ‘hear’ that there is information being transferred, it could logically just wait a second (or some other set amount of time), then send its signal out unobstructed.

-The problem with this solution is:

What happens when two computers wait the same duration?

What if two computers both start waiting at the same time? The answer: A Collision

Solution

The solution to this problem comes in two parts

1. Each computer is set to wait one second, + an additional random number of milliseconds.

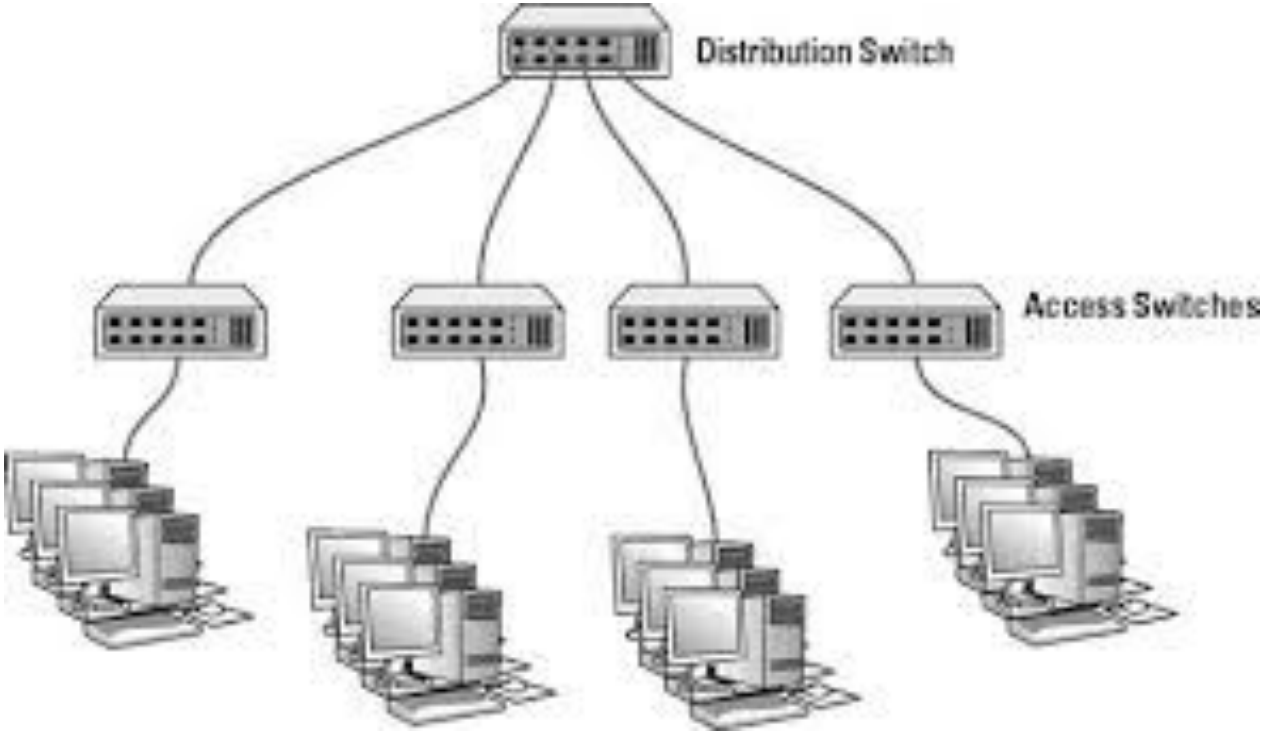
2. If a computer waits, tries again, and there is still traffic, it will wait 2 seconds. If there is traffic on the second attempt, it will wait 4 seconds.

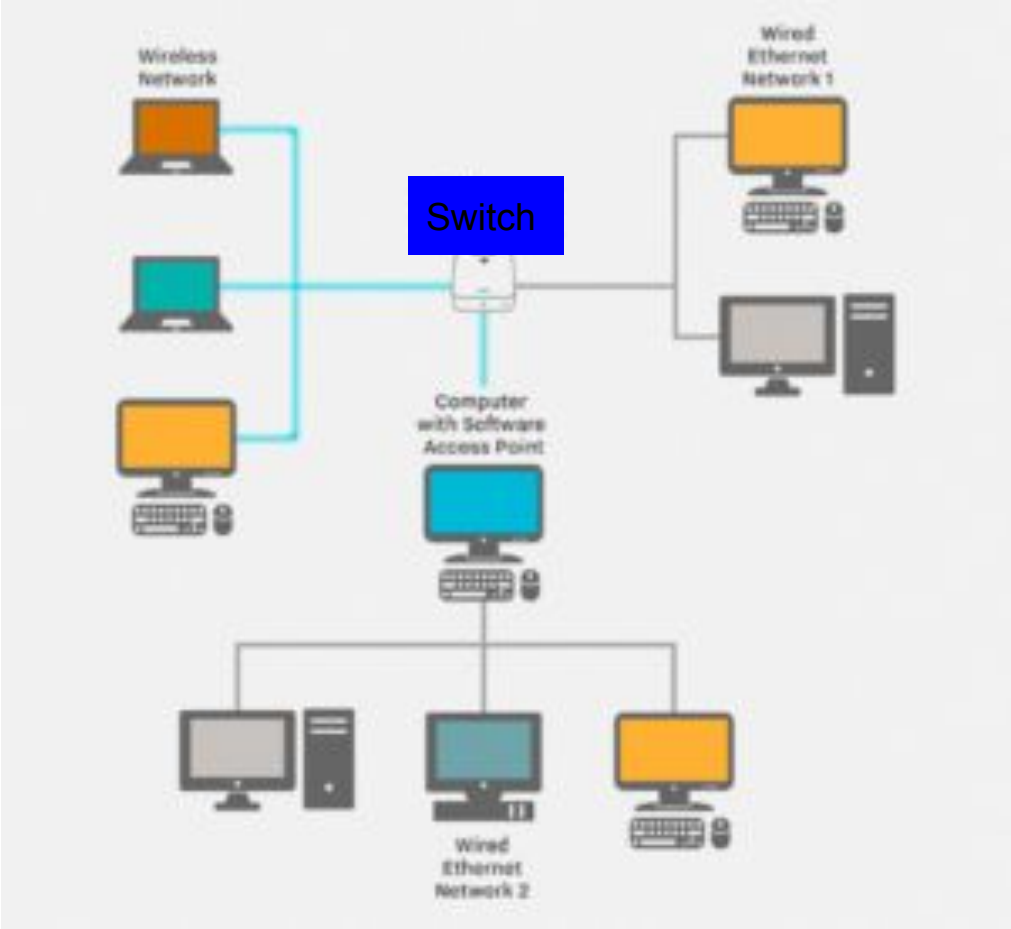
This is called Exponential Backoff

Switches

Allow for a particular section of a network to be independent when interacting with nearby computers, but branch off to further reaches of the network when needed.

This allows for more localized, and less chaotic network traffic


Distribution Switch
Access Switches


Wireless Network
Wired Ethernet Network 1
Switch
Computer with Software Access Point
Wired Ethernet Network 2