

A Brief History of the Internet

CITS3403 Agile Web Development

2018 Semester 1

In the beginning there was... Laika?



Then there was ARPAnet...



- and the space-race began...
- DoD created the Advanced Research Projects Agency (ARPA) in 1958 (now DARPA)
- ARPA wanted
 - communications, program sharing, remote computer access
 - robust - continue to work if some nodes “taken out” by malicious forces
- ARPAnet - late 1960s and early 1970s
 - about a dozen ARPA-funded research labs and universities
 - graduate students played a large part in its development!
 - didn’ t live up to intentions - mostly text-based email, limited reach
 - but the snowball had started rolling...

**Translated from the original American.*

...and BITnet and CSnet...



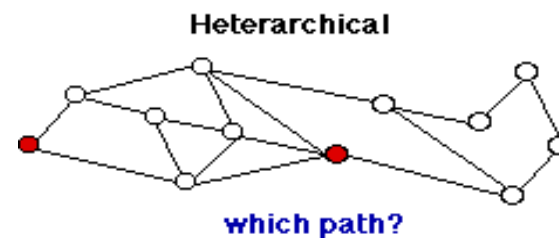
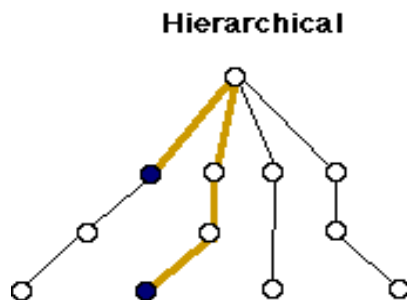
- Non-ARPA-funded Universities wanted in
 - number of other networks created in the late 70s and early 80s
- BITnet (Because It's Time Network)
 - out of City University of New York
 - initially electronic mail and file transfer
- CSnet (Computer Science Network)
 - a number of Uni's and corporations
 - primarily email

...and NSFnet

- NSFnet - 1986
 - National Science Foundation (NSF)
 - originally for non-DoD funded places
 - initially connected five supercomputer centers
 - spread to other academic institutions and research labs
 - 1988/89 - commercial infiltration - mail, ISPs
 - by 1990, it had replaced ARPAnet for non-military uses
 - soon became the network for all (by the early 1990s)
 - other networks created gateways and eventually merged
 - JANET, BITnet, Usenet,...
 - >1M computers around the world by 1992
 - NSFnet eventually became known as the Internet

Dynamic routing

- For robust networks, a transmission protocol must find new routes to a destination as preferred routes fail.
- This is achieved by **dynamic routing**, where the routes are selected at the time of transmission, after considering current network conditions.
- Dynamic routing requires a network architecture devoid of critical sites, whose failure will bring down the entire network. That is, the network cannot be hierarchical.



The Largest Inter-connected network – the Internet

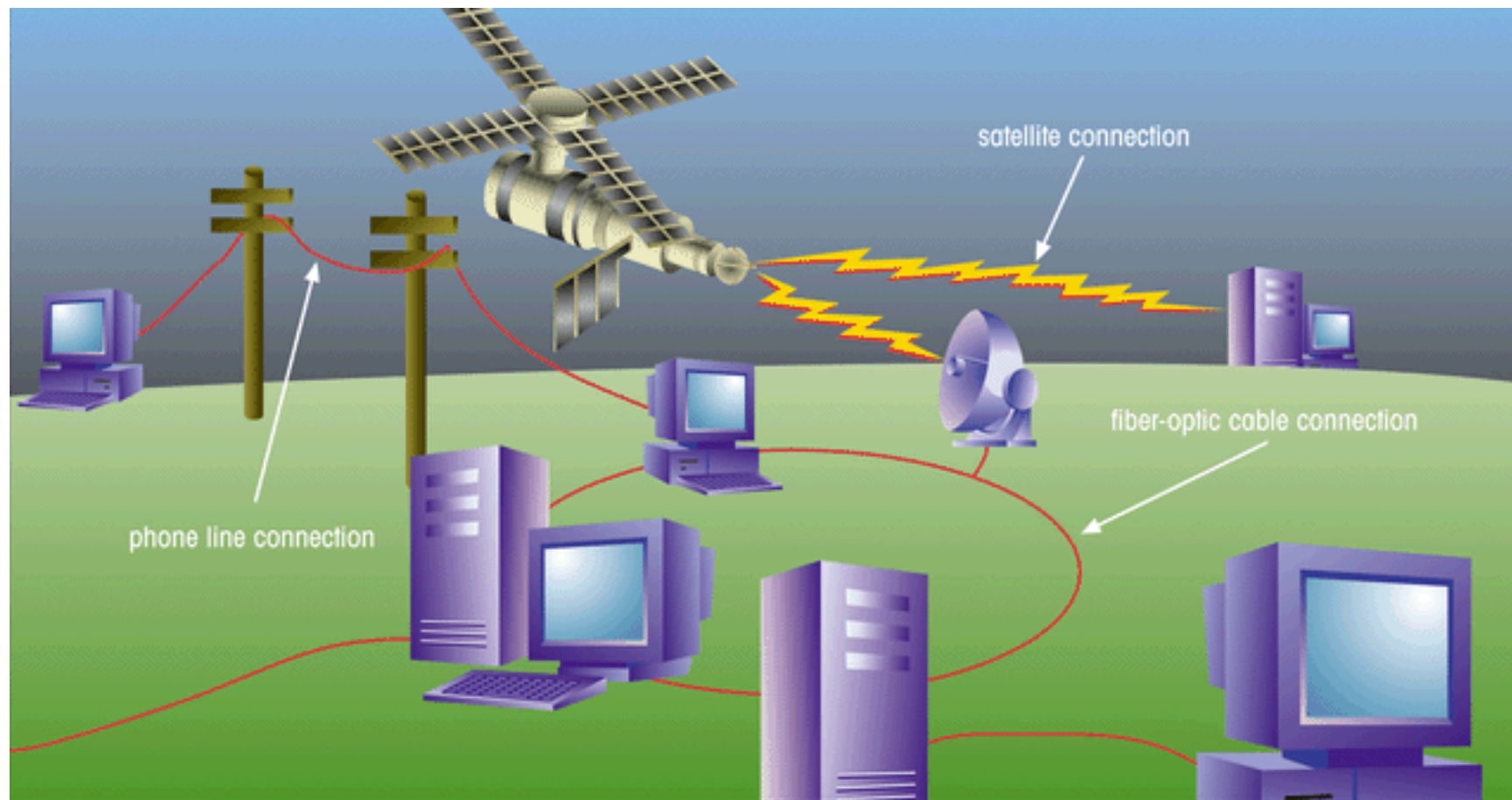
- If the computers that make up a network are close together (within a single department or building), then the network is referred to as a **local area network (LAN)**.
- A network that covers a wide area, such as several buildings or cities, is called a **wide area network (WAN)**. The largest **WAN** in existence is the **Internet**.

Physical Structure of the Internet



- Today the Internet has grown to include hundreds of millions of interconnected computers, smart phones, PDAs, televisions, printers and networks
- The physical structure of the Internet uses fiber-optic cables, satellites, phone lines, and other telecommunications media

Structure of the Internet



In summary, the Internet is

- A network connects computers so they can communicate, exchange information, and share resources.
- The Internet is an infrastructure, in particular a global computer network, supporting data transmission.
- The **Internet is a network of interconnected networks**. If part of its infrastructure is destroyed, data can still flow (in principle) through the remaining networks.
- The Internet uses high-speed data lines (backbones) to carry data. Smaller networks connect to the backbone, enabling any user on any network to exchange data with any other user.

How the Internet works

- TCP/IP
- Addressing Schemes
- Domains and Sub-domains
- Routing Traffic Across the Internet

How the Internet works - Protocols

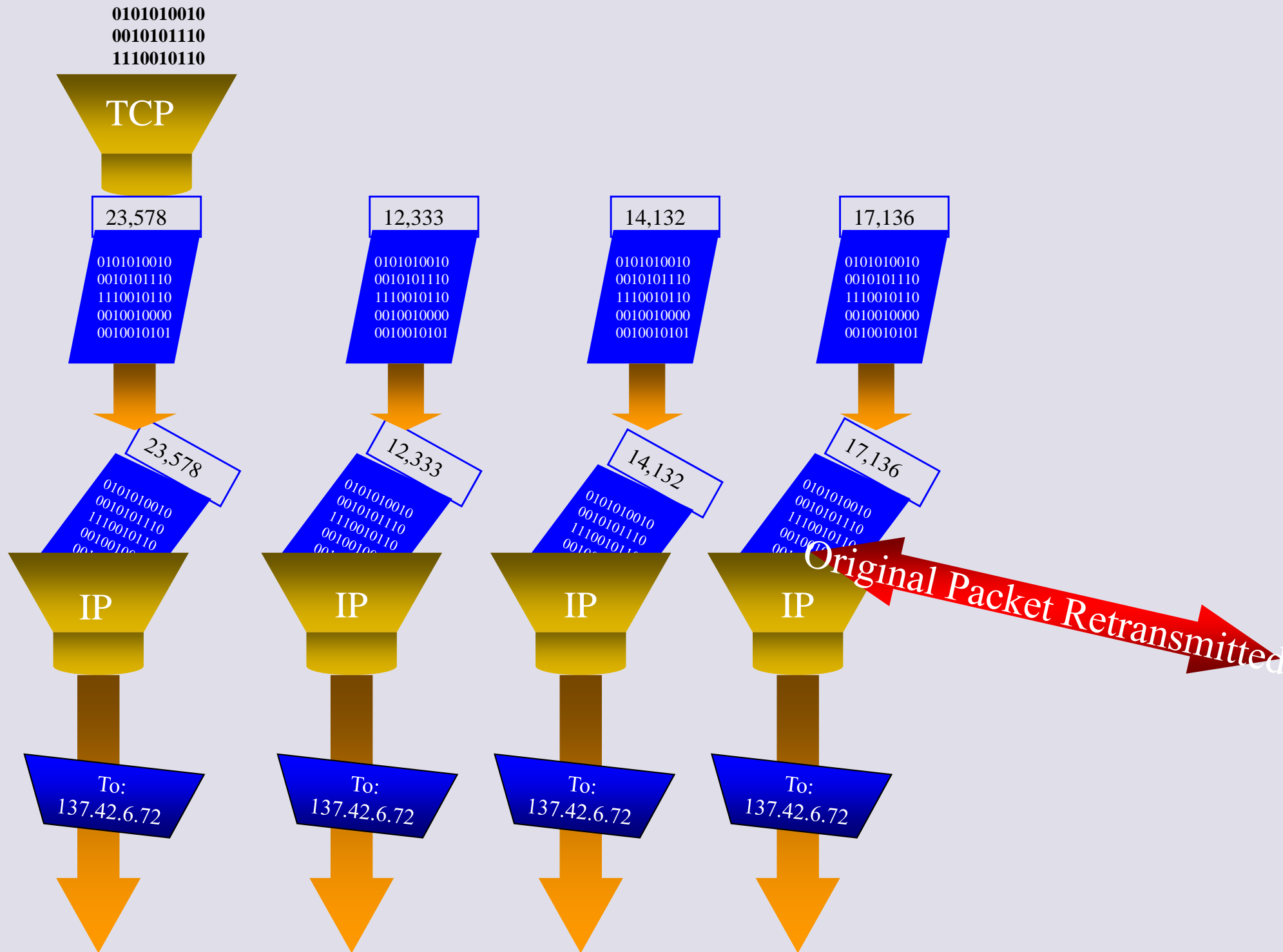


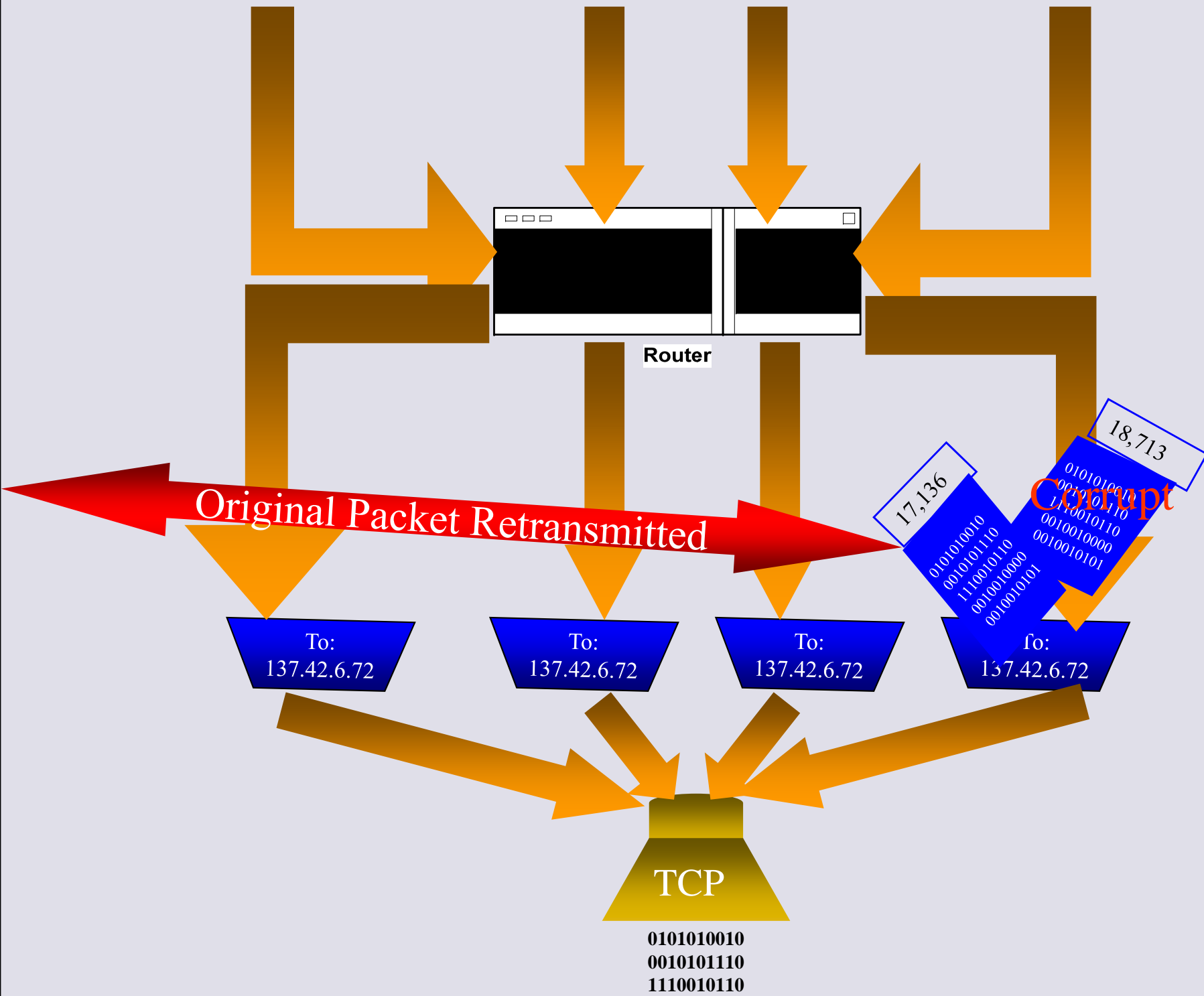
- Network communication is made possible only if computers “speak” a common language. The rules and procedures for controlling timing and data format are the protocols and they,
 - **signal** another computer requesting communication. (client)
 - **identify** the requesting computer. (server)
 - **transmit** messages in blocks. (server)
 - **retransmit** if messages fail to arrive. (server)
 - **detect** errors and recovers. (client)
 - **signal** transmission is complete. (client)
 - **terminate** the connection. (server)

How the Internet Works – TCP/IP



- Every computer and network on the Internet uses the same protocols - the Transmission Control Protocol/Internet Protocol, or TCP/IP.
- No matter what type of computer system you connect to the Internet, if it uses TCP/IP, it can exchange data with any other type of computer.
- TCP/IP was developed to tolerate unreliable sub-networks and the protocol guarantees proper transmission of data, since the physical network can't.
- For transmission not needing guarantees (even unreliable networks are very reliable) one can use User Datagram Protocol (UDP). Data transmitted by UDP arrive faster, with none of the error detection or correction overheads that are in TCP/IP.





Bulletin Board Systems (BSS)

- Early interactive software, late 1970s to 1980s
- Users login to:
 - exchange messages through mail or public message boards
 - read news and bulletins
 - upload/download software
 - even on-line games
 - accessed using modem and phone line
 - precursor to today's WWW

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[M] Monochrome (1.101w 07-May-08) (Last on Wed May 14 13:36) [M]
-----
                O B S C U R E  C O M M U N I T Y
New streamlined layout! Easier to use! New files! Extra exclamation marks!
-----
                Dish some dirt at <MTO> today!
-----
                                archon ~-
Menu [ESC] = Utilities (inc. Talker & EXIT)
You don't use ssh. Boo! Menu [I] = Help and Information on Monochrome
Welcome to the new version of Monochrome! (version 1.101w)
Menu [N] = News and Media
Menu [T] = Science, Technology and Medicine
Menu [E] = Entertainment
Menu [C] = Society and Culture
Menu [R] = Recreation
Menu [M] = Monochrome Users
Hello 'SexDrugs&DrumMachinesForAgRaveGeneration'. (evilandi:4)
<< 22 other users at Sun Jan 11 19:30 BST >>

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Usenet

- Idea conceived by Duke University grad students in 1979
- Unlike BBS, distributed network of servers (eg. each university)
- Large number of forums called *newsgroups* (not just news - users posts)
- Threaded discussions
- Formed social communities
- Precursor to Internet forums



Source: Benjamin D. Esham, Wikimedia Commons
http://en.wikipedia.org/wiki/File:Usenet_Big_Nine.svg

Power to the People - the “Killer App”

Early internet mainly used by people in Uni’ s
and research labs

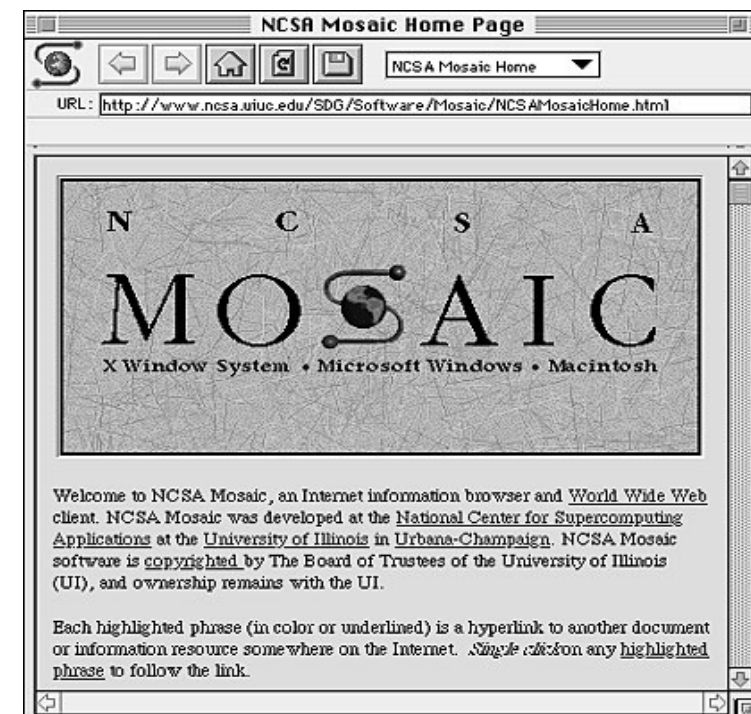
- 1991, CERN publicised new World Wide Web project
- Invented by Tim Berners-Lee and colleagues in 1989
- used TCP (Transmission Control Protocol) and DNS (Domain Name System)
- first browser WorldWideWeb on NeXTSTEP
- httpd (HyperText Transfer Protocol daemon) web Server



Power to the People - the “Killer App”



- 1993 National Center for Supercomputing Applications (NCSA) at University of Illinois releases V1.0 of Mosaic browser
 - written by a student, Marc Andreessen, and Eric Bina
 - first multimedia browser (mixed images and text)!
- Explosion in internet use!
 - growth of web usage in 1000s of percent
 - changed internet use forever
 - the “killer app” of the 90s



Power to the People - the “Killer App”

Evolved into Netscape

- Netscape Communications the “Google” of the 90’ s
- took on the might (and monopoly) of Microsoft...
- and eventually lost, tho its legacy lives on



“One of Netscape's stated goals was to "level the playing field" among operating systems by providing a consistent web browsing experience across them. The Netscape web browser interface was identical on any computer. Netscape later experimented with prototypes of a web-based system which would enable users to access and edit their files anywhere across a network, no matter what computer or operating system they happened to be using. This did not escape the attention of Microsoft...”

See http://en.wikipedia.org/wiki/Netscape_Communications_Corporation for more (anti-trust lawsuits, \$750M payouts,...)

=> *The Browser Wars!*

Power to the People - the “Killer App”

...Which evolved into Mozilla

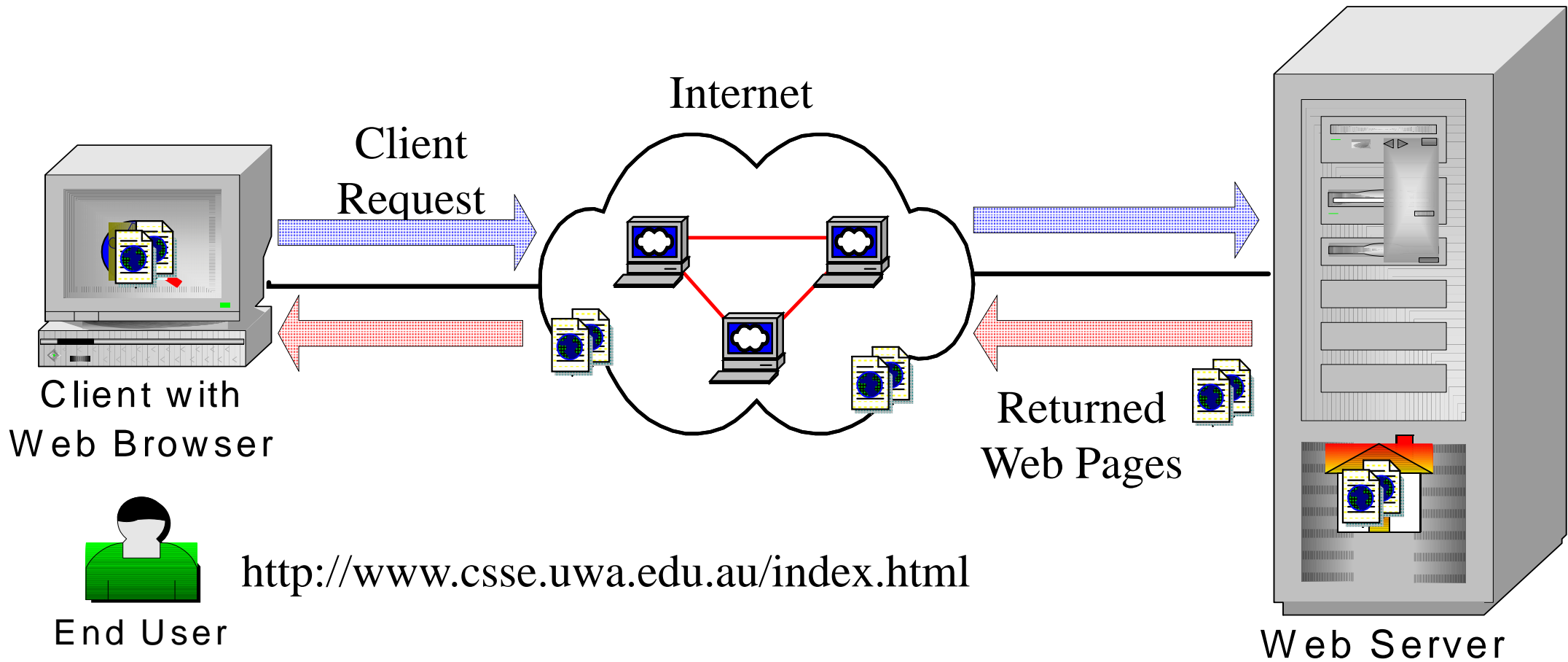
- Netscape open sourced code, 1998
- allow continued community development
- ...Which evolved into Firefox!



Firefox® 3



What are the main components here



What does a client do?



- Once wired, the user accesses the Web via software, called a browser (e.g. Firefox or Internet Explorer).
- Browsers locate and display information from the Web.
- Communication is by an agreed transmission language or protocol, eg. HTTP (HyperText Transfer Protocol).
- The user requests a Web page through the browser, which communicates this to the server.
- The browser waits for the Web page to be delivered, typically a text file containing HTML instructions.
- The intricate graphics and formatting results from the browser rendering that page in the format defined in the file.

What does a server do?



- The server's job is somewhat easier.
- The server is software running on a computer, and it responds to client requests for Web pages.
- The Web pages exist on its local file system.
- The server retrieves and then transmits the files to the client.

What does the “cloud” do?



- A **network** is a structure linking computers together for the purpose of sharing resources such as printers and files
- Users typically access a network through a computer called a **host** or **node**
- A computer that makes a service available to a network is called a **server**
- A computer or other device that requests services from a server is called a **client**
- One of the most common network structures is the **client-server architecture**



But What is Web 2.0?

The first Web 2.0 conference was held in 2004 in San Francisco

- believed to be the point at which the term Web 2.0 came into popular usage
- something to do with wikis? blogs? collaborative sites?

Ajax?...

- but can anyone agree on what it is?

Tim O' Reilly:

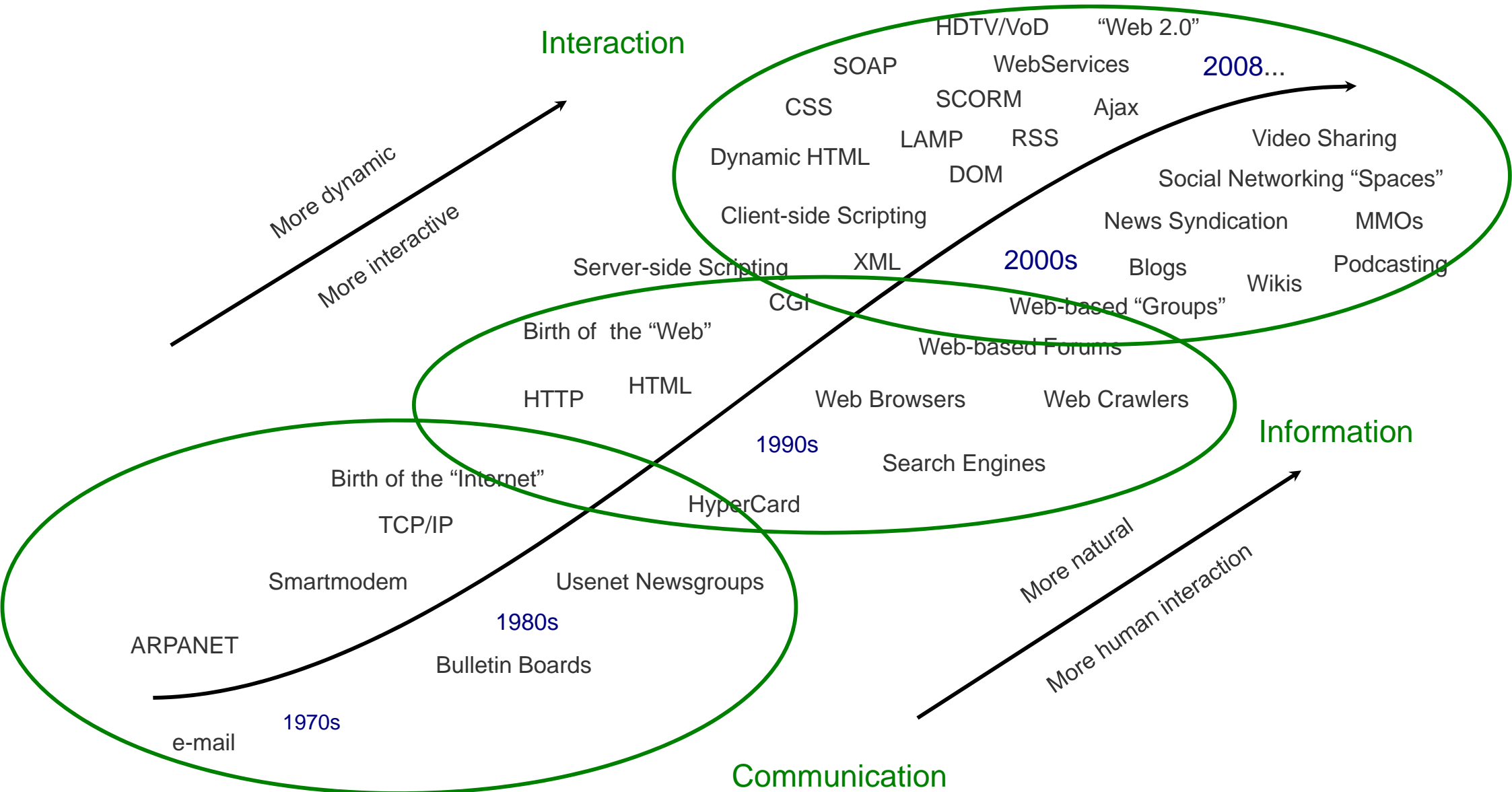
“ Web 2.0 is the [business revolution](#) in the [computer industry](#) caused by the move to the [Internet](#) as [platform](#), and an attempt to understand the rules for success on that new platform.”

Stephen Fry, The Guardian

“ ...an idea in people's heads rather than a reality. It's actually an idea that the reciprocity between the user and the provider is what's emphasised. In other words, genuine interactivity, if you like, simply because people can upload as well as download. ”



A shot at a definition...



Web 3.0?

- There are many emerging technologies in the web space, and many more changes on the way:
 - Semantic web: *moving from content to meaning*
 - Ubiquitous computing: *because of course your watch, shoes and sunglasses should be online.*
 - Natural language processing and soft-phones: *symmetry between users and content.*
 - Internet of things: *everything is better when it is connected to the internet.*
 - Cloud services: *removing the infrastructure barrier.*
- [WWW2017](#) was in Perth last year!

