THE UNIVERSITY OF WESTERN AUSTRALIA

# Introduction to Agile Web Development

CITS3403 Agile Web Development

Unit Coordinator: Tim French

2023, Semester 1

# Welcome to CITS3403 Agile Web Technology

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- Focus on ***programming*** for the WWW and ***agile software development***
- Includes
  - How the web works
  - Markup languages and protocols
  - Web Styling with CSS and Bootstrap
  - Document object models and event handling
  - Client-side scripting with Javascript, JQuery and AJAX
  - Flask Python web application development
  - Agile development and GIT
  - MVC architecture and object relational modelling
  - Deployment
  - REST APIs
- Primarily use open source and free technologies
  - you can use it at home


# Agile Web Development: Unit Information

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- Unit links:
  Webpage:http://teaching.csse.uwa.edu.au/units/CITS3403/
  LMS:https://lms.uwa.edu.au/
  Help Forum: Microsoft Teams

### Contact Hours

Each student should attend (or view) the two hour lecture, complete a two hour lab and attend or view the workshop every week. Attendance will not be taken. Online labs will be conducted via MSTeams.

| Type | Time | Day | Location |
|---|---|---|---|
| Combined Lecture | 3:00 - 5:00 pm | Wednesday | Ross Lecture Theatre |
| Combined Workshop | 9:00-11:00am | Friday | Clews Lecture Theatre |
| CITS5505 Lab | 1:00-3:00pm | Monday | MATH: 203D and Microsoft Teams |
| CITS3403 Lab | 8:00-10:00am | Tuesday | CSSE: 201 and Microsoft Teams |
| CITS3403 Lab | 10:00-12:00pm | Tuesday | CSSE: 201 and Microsoft Teams |
| CITS3403 Lab | 12:00-2:00pm | Wednesday | CSSE: 205 and Microsoft Teams |
| CITS3403 Lab | 8:00-10:00am | Thursday | CSSE: 205 and Microsoft Teams |
| CITS5505 Lab | 9:00-11:00am | Thursday | MATH: 123D and Microsoft Teams |
| CITS3403 Lab | 10:00-12:00pm | Thursday | CSSE: 203 and Microsoft Teams |
| CIT3403 Lab | 11:00-1:00pm | Friday | CSSE: 201 and Microsft Teams |
| CIT3403 Lab | 1:00-3:00pm | Friday | CSSE: 201 and Microsft Teams |
| CIT3403 Lab | 3:00-5:00pm | Friday | CSSE: 201 and Microsft Teams |
| Consultation | 10:00-12:00pm | Wednesday | CSSE Rm 2.14 and Microsoft Teams |

- Teaching Staff:
  - Unit coordinator: Dr Tim French (tim.french@uwa.edu.au)
  - Lab Facilitators: Tom Smoker, Lauren Gee, Pascal Sun, Chau Nguyen, Daivik Anil.

### Assessment

The assessment for CITS3403 consists of a mid-semester test, a group project and a final take home exam.

The assessment for CITS5505 consists of an individual project, a group project and a final take home exam.

| Assessment | % of Final Mark | Due Date |
|---|---|---|
| CITS3403 Mid-semester Test | 20 | 31-03-2023 |
| CITS5505 Individual Project | 20 | 17-04-2023 |
| Group Project | 30 | 22-05-2023 |
| Final Exam/Take Home Test | 50 | 1-06-2022 |

# Unit Timetable

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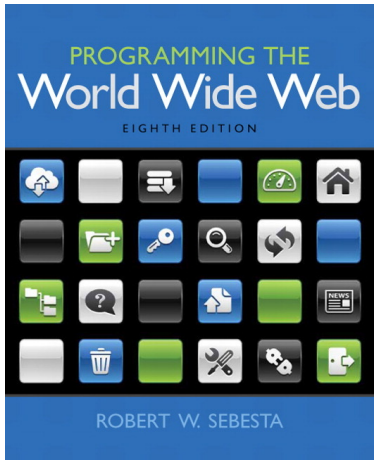
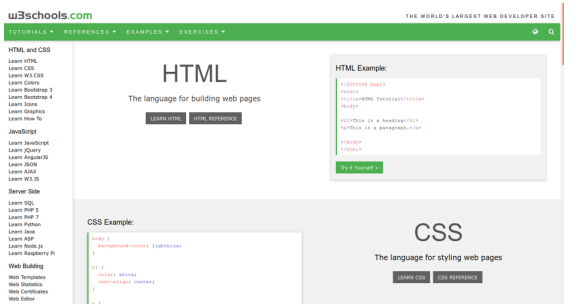
| | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| 8:00 AM | | CITS3403 (SEM-1) Laboratory CSSE: [ 201] Wks 10-14, 16-21<br>CITS3403 (SEM-1) Laboratory Wks 10-14, 16-21 | | CITS 3403 (SEM-1) Laboratory CSS<br>CITS 3403 (SEM-1) Laboratory | |
| 9:00 AM | | | | CITS 5505 (SEM-1) Laboratory MAT<br>CITS 5505 (SEM-1) Laboratory | CITS 3403 (SEM-1) Workshop BUV<br>CITS 3403 (SEM-1) Workshop<br>CITS 5505 (SEM-1) Workshop BUV<br>CITS 5505 (SEM-1) Workshop |
| 10:00 AM | | CITS3403 (SEM-1) Laboratory CSSE: [ 201] Wks 10-14, 16-21<br>CITS3403 (SEM-1) Laboratory Wks 10-14, 16-21 | Consultation Rm 2.14 CS & MS Teams | CITS 3403 (SEM-1) Laboratory CSS<br>CITS 3403 (SEM-1) Laboratory | |
| 11:00 AM | | | | | CITS3403 (SEM-1) Laboratory CSSE: [ 201] Wks 10-14, 16-21<br>CITS3403 (SEM-1) Laboratory Wks 10-14, 16-21 |
| 12:00 PM | | | CITS3403 (SEM-1) Laboratory CSSE: [ 205] Wks 10-14, 16-21<br>CITS3403 (SEM-1) Laboratory Wks 10-14, 16-21 | | |
| 1:00 PM | CITS5505 (SEM-1) Laboratory MATH: [ 123D] Wks 10-14, 16-21<br>CITS5505 (SEM-1) Laboratory Wks 10-14, 16-21 | | | | CITS3403 (SEM-1) Laboratory CSSE: [ 201] Wks 10-14, 16-21<br>CITS3403 (SEM-1) Laboratory Wks 10-14, 16-21 |
| 2:00 PM | | | | | |
| 3:00 PM | | | CITS 3403 (SEM-1) Lecture PHY<br>CITS 3403 (SEM-1) Lecture<br>CITS 5505 (SEM-1) Lecture PHY<br>CITS 5505 (SEM-1) Lecture | | CITS3403 (SEM-1) Laboratory CSSE: [ 201] Wks 10-14, 16-21<br>CITS3403 (SEM-1) Laboratory Wks 10-14, 16-21 |
| 4:00 PM | | | | | |
| 5:00 PM | | | | | |

# Recommended Readings



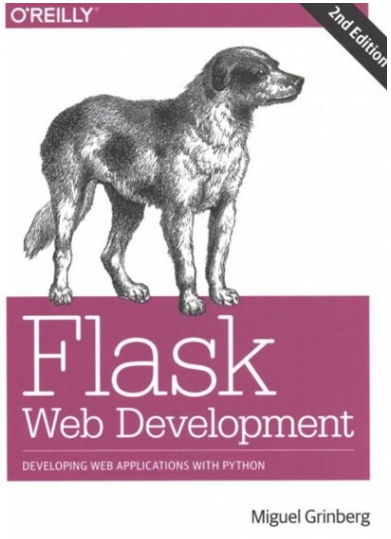

- **General Reference**

Robert W. Sebesta,
*Programming the World Wide Web 2015*,
8th Edition,
Pearson/Addison Wesley.



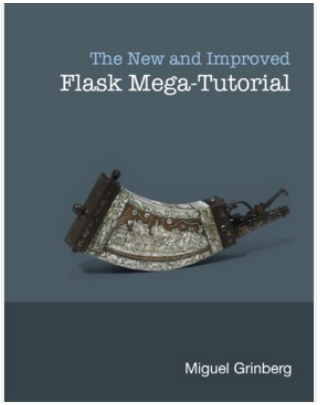

- **For Labs Part I**
- W3Schools, available at:

**https://www.w3schools.com/**




- **General Reference**

Miguel Grinberg,
*Flask Web Development*,
2nd Edition, O'Rielly,
2018




- **For Labs Part II**

Miguel Grinberg
Flask Mega-Tutorial
Available at:
**https://blog.miguelgrinberg.com/post/the-flask-mega-tutorial-part-i-hello-world**

# Assessment

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- CITS5505 Project 1: Due Monday April 17, 5pm
  - 20% of final grade
  - Write a basic web page, with researched content
- CITS3403 Mid-semester test: Friday March 31, 9am LMS Online.
  - 20% or final grade
  - 4-5 questions, written answers, 60 minutes
- CITS3403/5505 Project: Monday, May 22.
  - 30% of final grade
  - Done in groups of 2-4
  - Build a Chat application. Lab work will step through this process.
- Final exam: Take home test in study week.
  - 50% of final grade

- Please ensure you have consulted the Unit Outline for information on:
  - unsatisfactory progress
  - late assessment penalties
  - plagiarism and AI tools policy
  - including ACE and academic misconduct
  - Faculty marks adjustment policy

Unit Contingency Plans:

- **What will happen to the unit in the event of lockdown, masking, or stringent social distancing, e.g.: moved online; lectures moved online with labs deferred; etc.**

  If required the unit will be moved entirely online. Lectures, workshops and labs will be streamed on Microsoft Teams, tests and exams will be conducted through LMS and assignments will be submitted electronically and demonstrated via video chat.

- **What will happen to the unit in the event of staff absence due to COVID-related reasons, e.g.: replacement lecturer; recorded lectures from previous years; etc.**

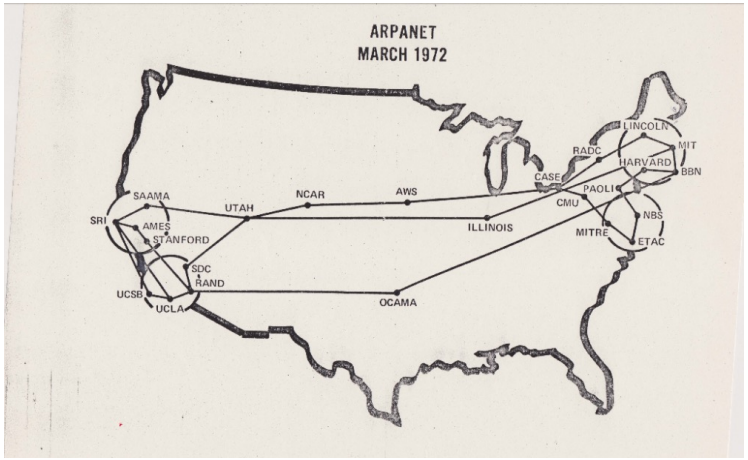
  Recorded lectures and workshops from previous years will be made available, and a replacement lecturer will be resourced to support students.

- **What the implications for students in the unit are if they get COVID or must self-isolate due to close contact. It will be important in this respect to remember the 2 week special consideration policy in play.**

  Students affected by COVID should inform the unit-coordinator, and special considerations will be applied. When students are well enough, they should continue to participate in the unit online.

# A Brief History of the Internet

- 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…
- Non-ARPA-funded Universities wanted in so other networks were created in the late 70s and early 80s
  - BITnet (Because It's Time Network), initially electronic mail and file transfer
  - CSnet (Computer Science Network), primarily email



# NSFnet: the birth of the internet

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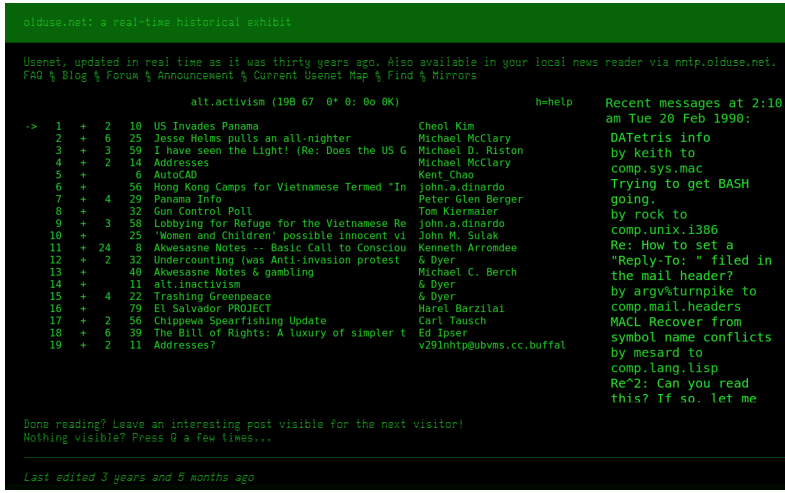
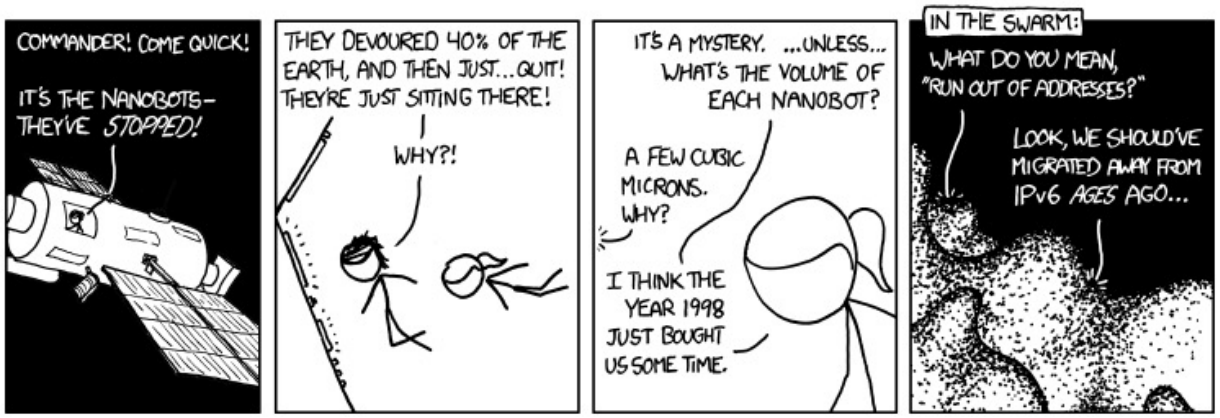
- NSFnet - 1986
  - National Science Foundation (NSF)
  - originally for non-DoD funded places
  - initially connected five supercomputer centers
  - spread to other academic institutions and research labs
  - 1988/89 - commercial infiltration - mail, ISPs
  - by 1990, it had replaced ARPAnet for non-military 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



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



# How the Internet works

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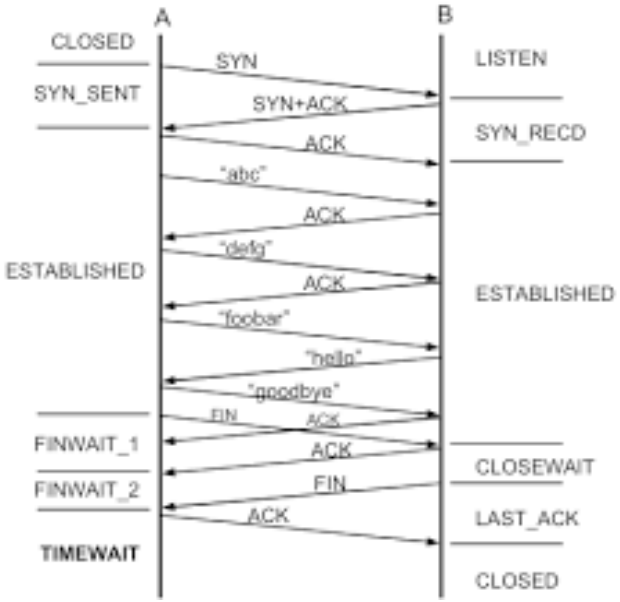
- TCP/IP
- Addressing Schemes
- Domains and Sub-domains
- Routing Traffic Across the Internet
- Client Server Architecture

# How the Internet works - Protocols

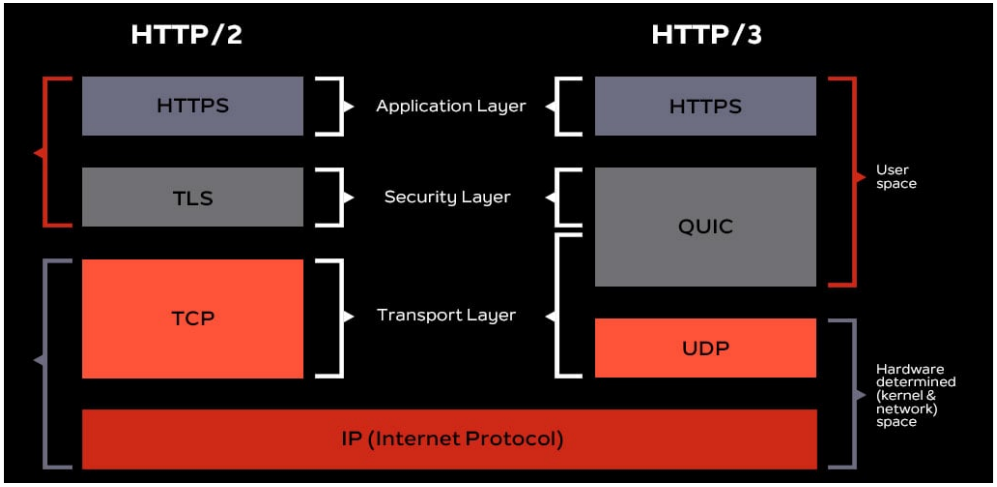
- Network communication is made possible only if computers “speak” a common language. The rules and procedures for controlling timing and data format are the protocols and they,
  - **signal** another computer requesting communication. (client)
  - **identify** the requesting computer. (server)
  - **transmit** 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)



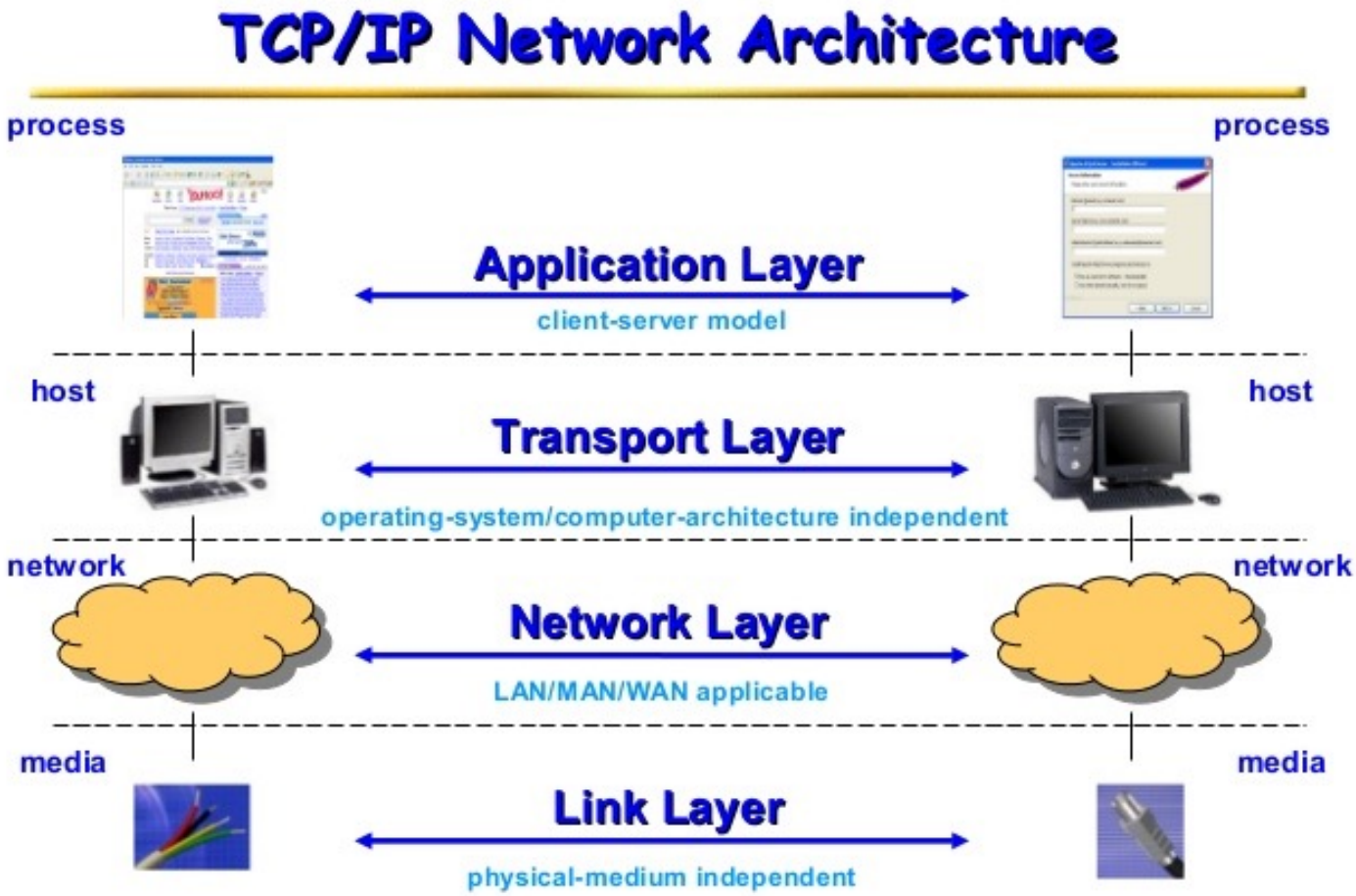
# How the Internet Works – TCP/IP

- 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.

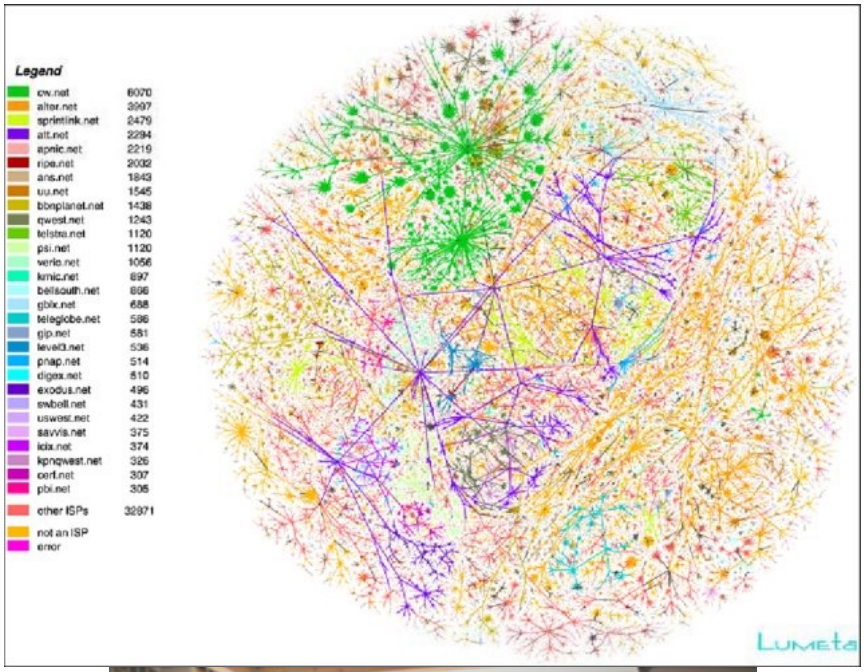


# How the Internet Works – TCP/IP



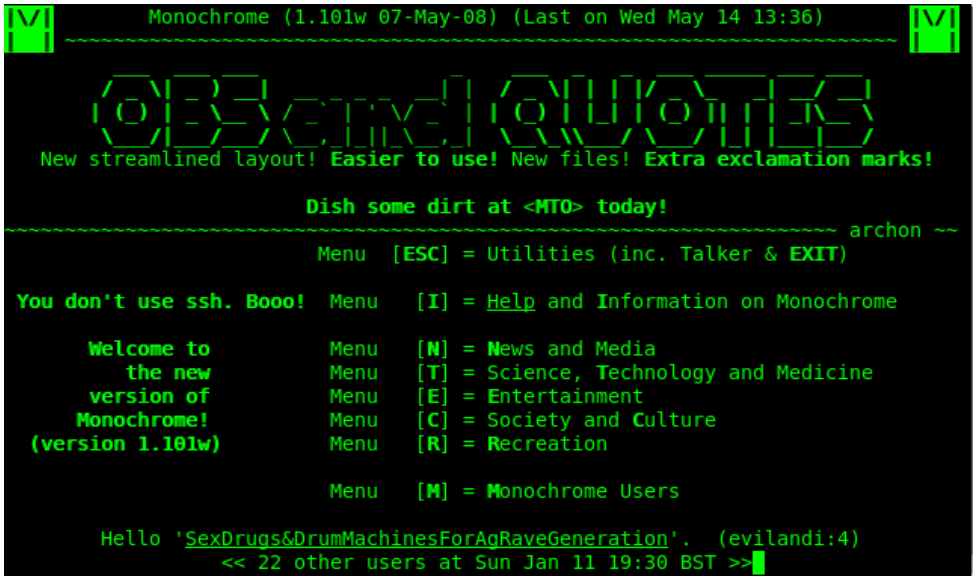
# In summary, the Intenet is

- 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.




# Internet Applications: Bulletin Board Systems (BBS)

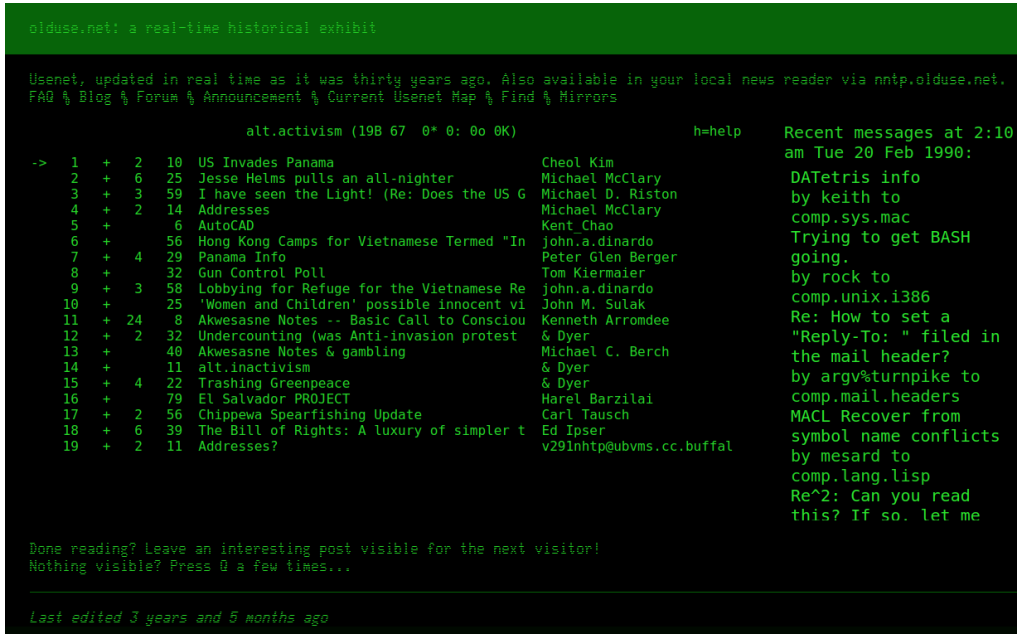
- Early interactive software, late 1970s to 1980s
- Users login to:
  - exchange messages through mail or public message boards
  - read news and bulletins
  - upload/download software
  - even on-line games
  - accessed using modem and phone line
  - precursor to today's WWW




http://en.wikipedia.org/wiki/File:Monochrome-bbs.png

# 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”

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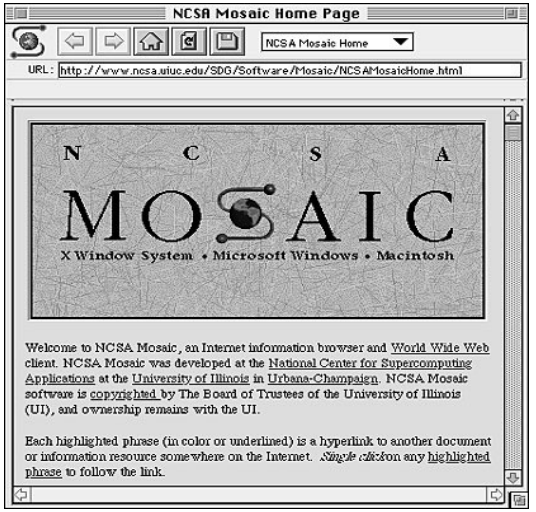
Early internet mainly used by people in Uni’s and research labs

- 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
- The "world –wide-web" is essentially the fragment of the internet accessible through web browsers.
- It is a unique engineering environment with obscure ownership and control.




# Client-Server Architecture
# What does a client do?

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- Once wired, the user accesses the Web via software, called a browser (e.g. Firefox or Chrome).
- 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.

# Client-Server Architecture: What does a server do?

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- 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.

# Anatomy of a URL

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http://www.domain.edu.au:1000/path/to/file?parameters=true#fragment

- The protocol used. Typically http, ftp, https, ...
- The domain name. A domain name server maps this to an IP address
- The port number. Servers have ports 0-65535, but http defaults to port 80.
- The path (route) to the file to execute. The file is typically an html file, but it could also be php, text, pdf.
- The parameters of the request. These are specified as a set of key value pairs.
- The fragment. This anchors to a location in a page.
- There are also hidden parts of the request including the browser name and cookies.

# New web technologies that shape future business models

## Transition in web technologies


| Features | The Hypertext Web<br>Read-only and Static Web | The Social Web<br>Interactive | The Semantic Web<br>Intelligent and decentralised |
|---|---|---|---|
| Content | Static content, passive viewing | Dynamic content, platform, collaborate | AI, 3D, blockchain, web learning |
| Use Cases | Content and information publishing | Social Media, Microblogs, content hosting, podcasts | DeFi, tokenization of asset, online gaming, distributed ledgers, NFT, CBDC, P2P transfer |
| Key Technologies | Content delivery network, HTML /portals, Netscape | Mobile, Applications, Big data, AI, blockchain | Blockchain apps, advanced AI, ML, Augmented Reality, IoT, 5G |
| Challenges | Lacks two-way communication option for users, No algorithms | Authentication controls, data ownership, Malware, data leak, data integrity | Personal data protection, cybercrime, AI bias |
| Examples | CNN, BBC | Amazon, Apple, Meta, Microsoft, Twitter, Google, Tik Tok | Amazon Alexa, Wolfram Alpha, Apple's Siri |

ChatGPT, Bard, …

*Source: TABInsights*