

Web 101

Essentials of Web Design

CSCI 1210

Welcome to the Course

Introductions

Syllabus Review

elearn.etsu.edu

Course Outline Review

elearn.etsu.edu

What We're Here to Learn

TECHNOLOGY

Technology ("science of craft") ...is the sum of any techniques, skills, methods, and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation

Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in machines to allow for operation without detailed knowledge of their workings

Systems (e.g., machines) applying technology by taking an input, changing it according to the system's use, and then producing an outcome are referred to as technology systems or technological systems

<https://en.wikipedia.org/wiki/Technology>

TECHNOLOGY

We often refer to Technology (capital 'T') in a general sense

Ignore the “inner workings,” i.e., we generally don't care *how* a television works, just as long as we can watch our favorite shows

Or, more to the point, *what happens* when we launch a web browser and navigate to a website

In this class, however, we're going to focus on some technologies (lower-case 't') that underlie the World Wide Web (by “lower-case t,” I mean a technology that is part of the greater, general, idea of Technology)

TECHNOLOGY

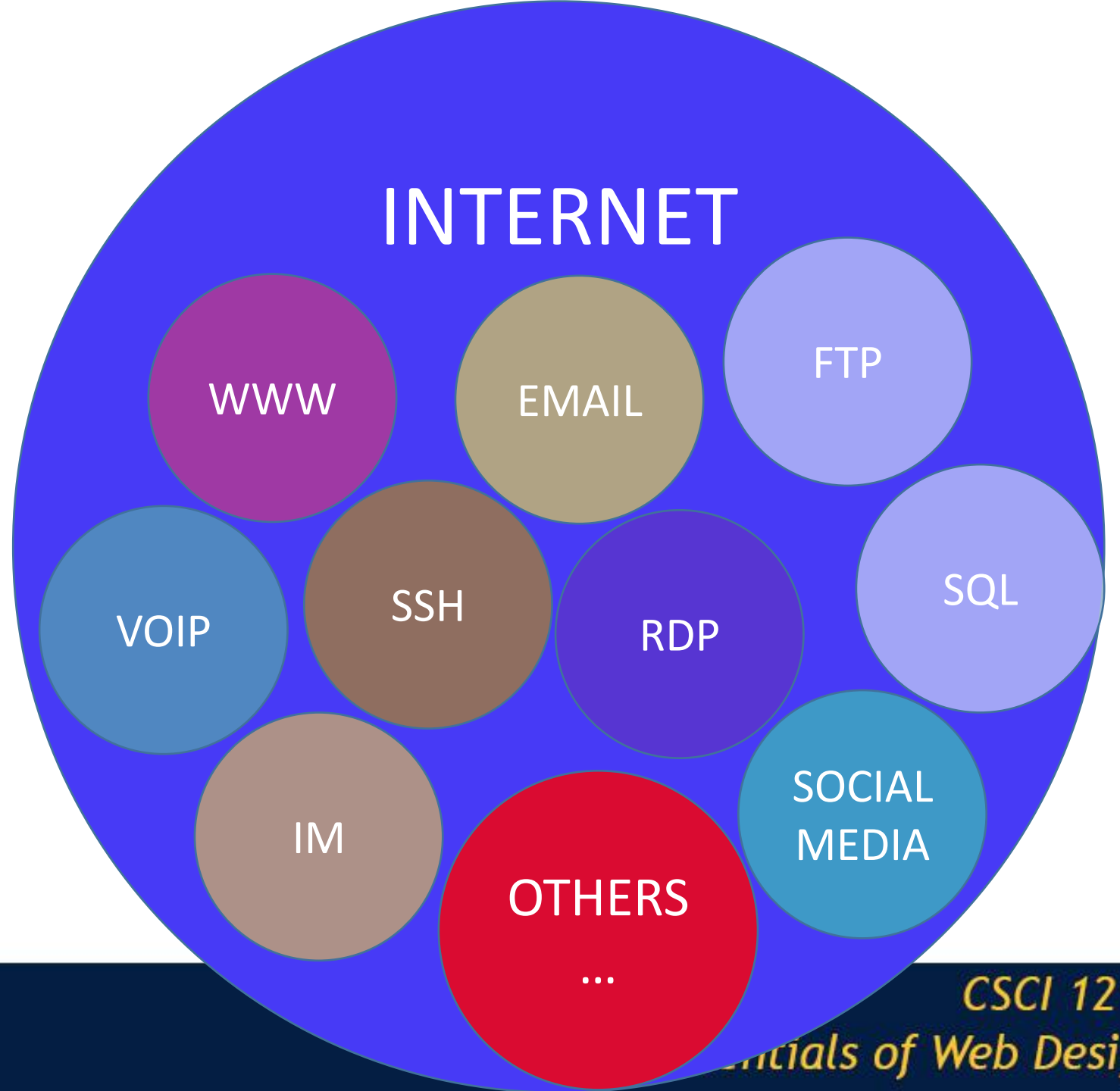
Our primary focus, with respect to Technology, will be twofold:

Hypertext Markup Language (HTML), and
Cascading Stylesheets (CSS)

Both are Internet technologies that are fundamental parts of the
World Wide Web

TECHNOLOGY

This is a little simplistic ... and ignores the fact that there's a lot of overlap of technologies -- 'Social Media,' for example, uses many more basic technologies to do its thing



TECHNOLOGY

Within the 'WWW'
technology, there are many
'sub-'technologies that
are/can be used

"Others," e.g.,

PHP

Bootstrap

Sass

jQuery

Angular

React

Django

Vue

WordPress

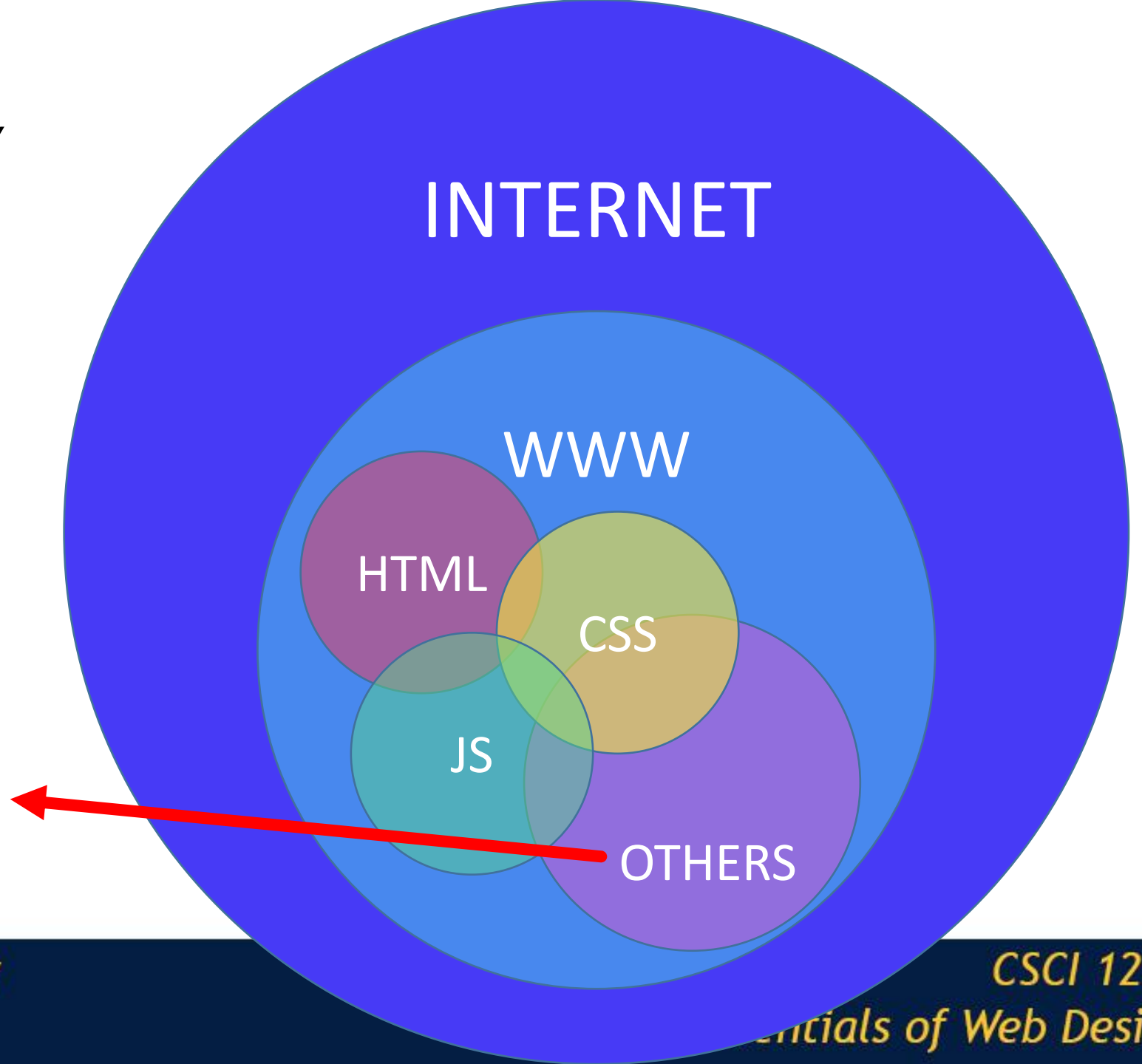
Typescript

Swift

Markdown

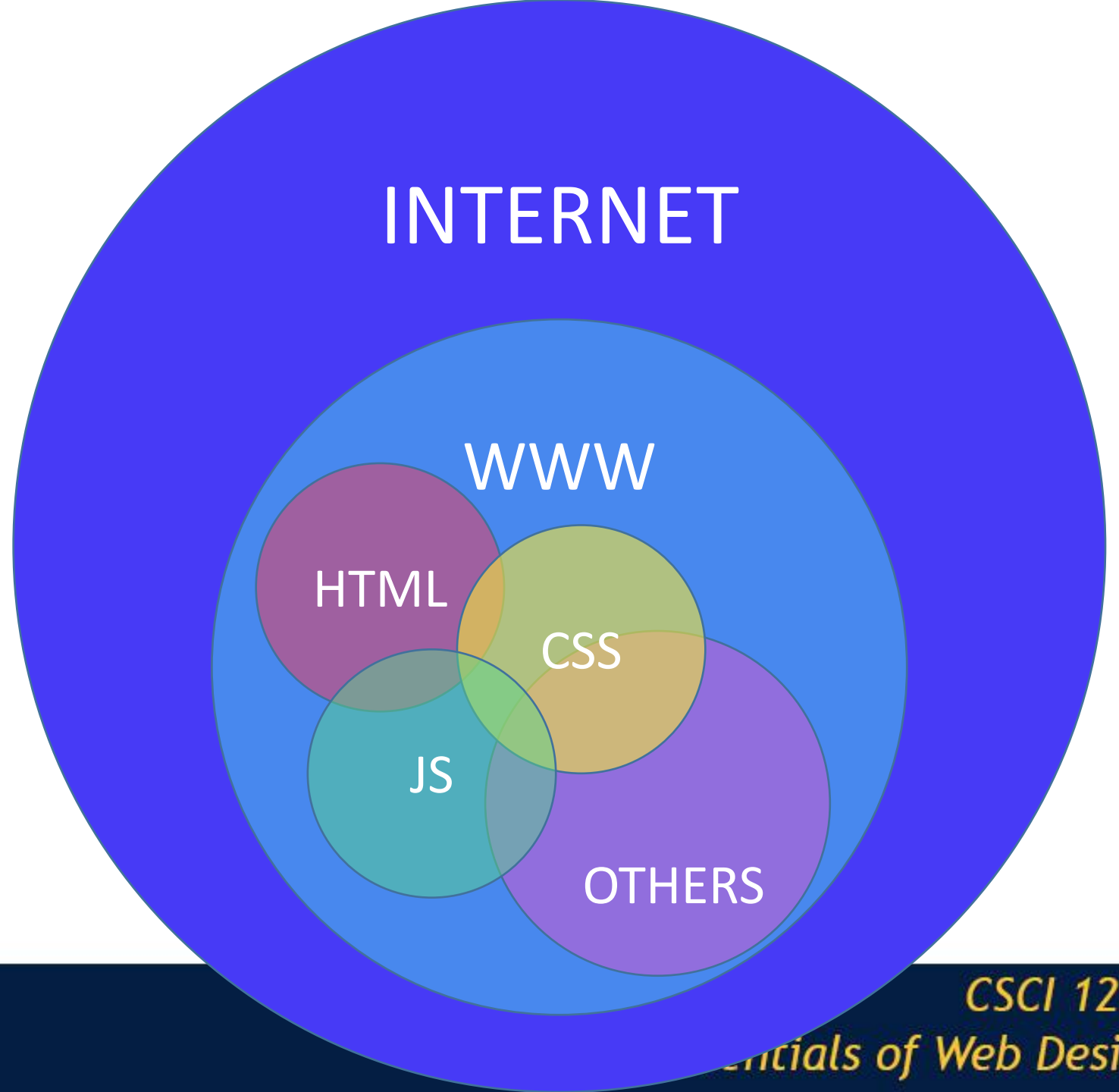
Laravel

Drupal



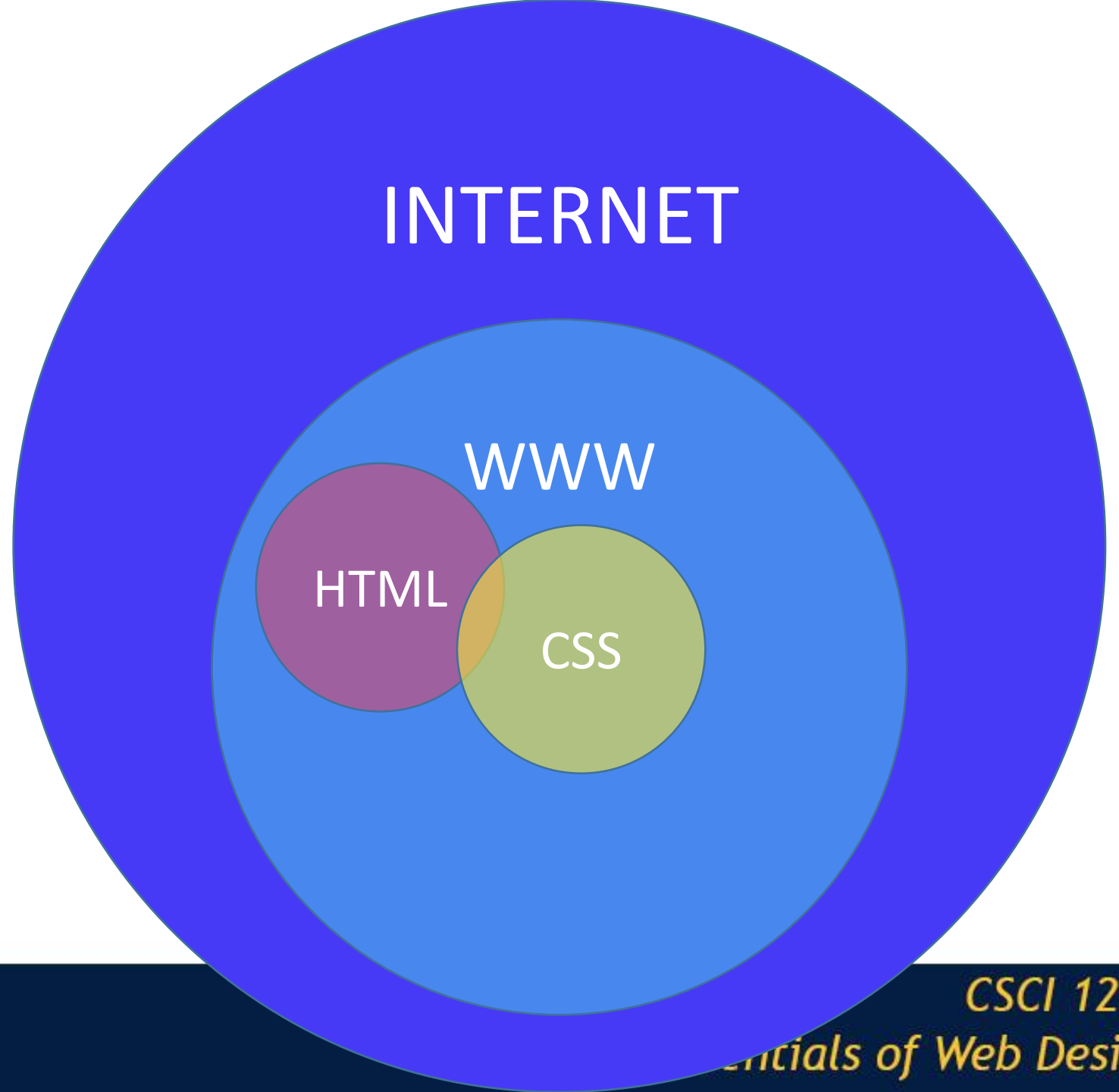
TECHNOLOGY

This semester, we'll be focusing - to a large degree - on these two:



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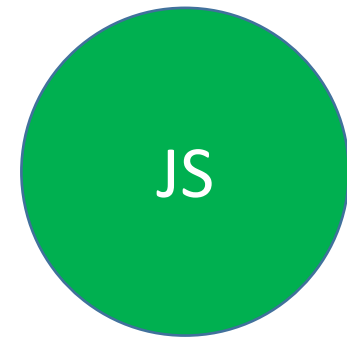
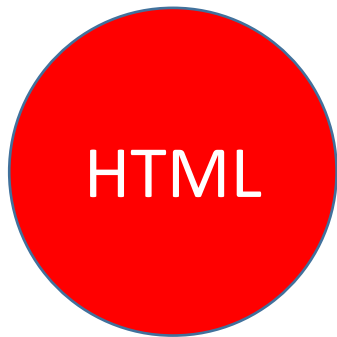


TECHNOLOGY

Google - "Front-end web development"

After all the Ads -- you'll find numerous sites, all of which say essentially the same thing:

The three core technologies associated with front-end web development are



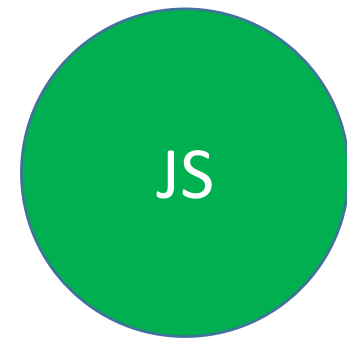
TECHNOLOGY

Google - "Front-end web development"

After all the Ads -- you'll find numerous sites, all of which say essentially the same thing:

The three core technologies associated with front-end web development are

We'll do a deep-dive in this, and other technologies, in CSCI 1720



TECHNOLOGY

It's important to note, however, that there is a lot more to Web Development than writing code (...and we will be writing a *lot* of code)

We'll also be devoting a lot of time to other concepts:

- Design concepts
- Design process
- Web Development Lifecycle
- Deployment
- SEO
- Marketing
- ...and lots more!

History and Terms

We are entering a technological age in which we will be able to interact with the richness of living information – not merely in the passive way that we have been accustomed to using books and libraries, but as active participants in an ongoing process, bringing something to it through our interaction with it, and not simply receiving something from it by our connection to it

JCR Licklider (1968), The Computer as a Communication Device

Origins...

The first recorded description of the social interactions that could be enabled through networking was a series of memos written by [J.C.R. Licklider \(1915-1990\)](#) of [MIT](#) in August 1962 discussing his "Galactic Network" concept.

He envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site.

[Brief History of the Internet – The Internet Society](#)

Origins...

In spirit, the concept was very much like the Internet of today. Licklider was the first head of the computer research program at the Defense Advanced Research Projects Agency ([DARPA](#)), starting in October 1962.

While at DARPA he convinced his successors at [DARPA](#), [Ivan Sutherland](#), [Bob Taylor](#), and MIT researcher [Lawrence G. Roberts](#), of the importance of this networking concept

[Brief History of the Internet – The Internet Society](#)

Which Came First, the Web or the Internet?

(Hint) The Internet

The **Internet** is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to link several billion devices worldwide

It is an international *network of networks* that consists of millions of private, public, academic, business, and government *packet switched* networks, linked by a broad array of electronic, wireless, and optical networking technologies

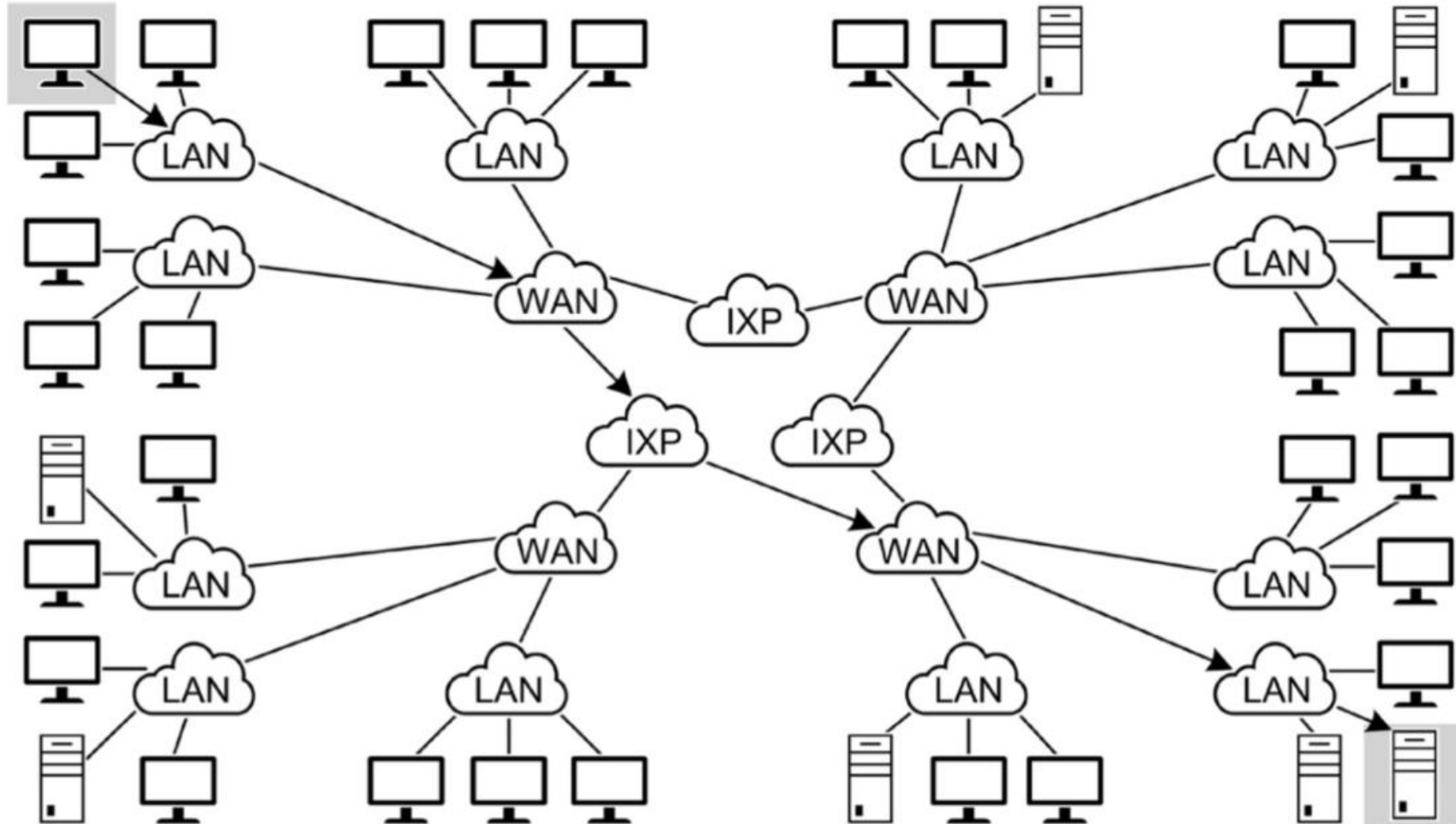
Which Came First, the Web or the Internet?

(Hint) The Internet

The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), the infrastructure to support email, and peer-to-peer networks for file sharing and telephony

Which Came First, the Web or the Internet?

The architecture of the Internet



Which Came First?

Internet!

Started as ARPANET – Advanced Research Project Agency Network.

Originally an MIT project that was handed off to the Department of Defense's Advanced Research Project Agency (APRA) in 1962

Launched in 1969 linking four computers at four universities (UCLA, Stanford, then University of Utah & University of California, Santa Barbara)

In the 1980s, evolved into a private/public partnership to provide networked connection to "Personal Computers"

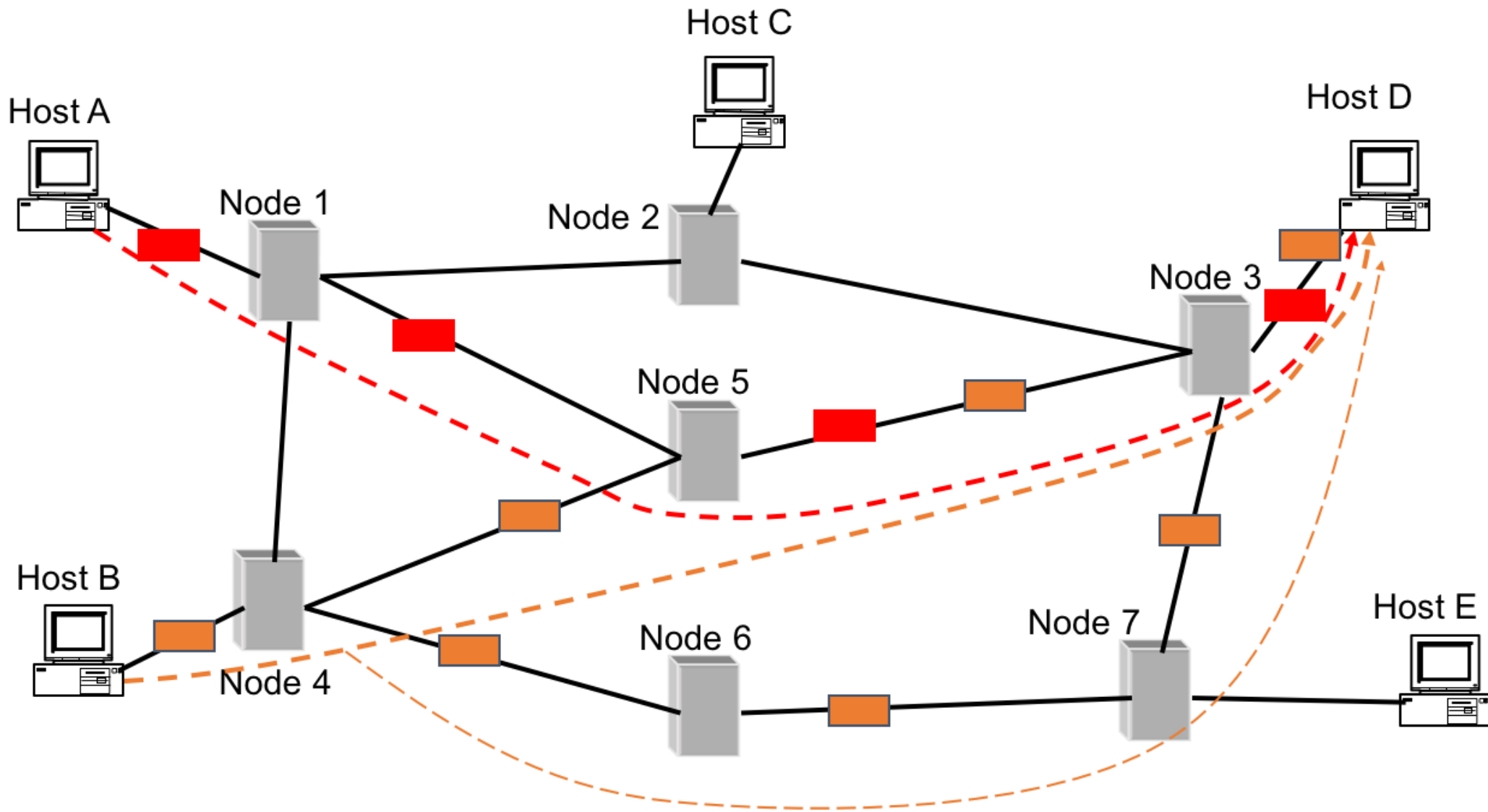
Back on Slide 10, You Mentioned Packet Switching...What the Heck is That?

A means of moving data

Developed as an alternative to circuit switching (Think: Sara, the unseen operator in the Andy Griffith show)

Instead of a dedicated circuit, data is broken into discrete chunks (packets), that are then transmitted to their destination and reassembled by the receiving client

How data is transported across the Internet



Our Favorite Part of the Internet...

The World Wide Web (WWW) is a system used on the Internet for transmitting and retrieving information in a platform independent, easy-to-use manner

The WWW is just one of many different technologies that take advantage of the Internet

email

streaming media

VoIP

Our Favorite Part of the Internet...

Created in 1989 by **Tim Berners-Lee** at CERN (Conseil Européen pour la Recherche Nucléaire or European Council for Nuclear Research). He helped to specify three fundamental technologies of the Web:

Hypertext Markup Language (HTML)

Uniform Resource Indicator (URI)

Hypertext Transfer Protocol (HTTP)

Note that by this time, the Internet had already been around for two decades



Our Favorite Part of the Internet...

[The first web page was served in 1990 at CERN](#)

By 1991, people outside of CERN were able to communicate via the World Wide Web

In April 1993, CERN announced that the technologies behind the World Wide Web would be available for **anyone** to use on a royalty-free basis

Some Terms to Help

Protocol – Established rules governing communication

IP – Internet (or Internetworking) Protocol. This is the protocol that specifies how information is transmitted over the Internet

Some Terms to Help

IP Address – A unique set of numbers assigned to each machine to identify that machine. Think of IP address as you would a phone number.

IPv4 – Created in 1980 to specify the IP address for each machine. Potential number of addresses – 4,294,967,296 (2^{32})

ex 127.0.0.1

ex 151.141.9.187

Spoiler alert: We've run out!

'Dotted Quad' - Addresses expressed as four decimal numbers separated by dots

Each segment ranges from 0-255, e.g., 151.141.92.9



If I cannot remember a phone number...

IP addresses are great. However, if you were to tell a perspective student to find out more information about ETSU by visiting 151.141.9.187, would that stick?

We need a way to translate these IP addresses into a memorable word or phrase – similar to contacts in your phone

If I cannot remember a phone number...

Domain Names – Names that are assigned to devices on the Internet to make it easier to refer to the device

Examples include ETSU.edu, IBM.com, WhiteHouse.gov

Most people are more adept at remembering alphabetic/word-based strings (e.g., *youtube.com* than strings of numbers)

The **Domain Name System** (more on that in a minute) is a hierarchical (tree-like) structure. There are several levels -

TLD – Top Level Domains – highest level of the Domain Name System

Examples include .com, .net, .gov

If I cannot remember a phone number...

TLD – Top Level Domains – highest level of the Domain Name System

Common TLDs include .com, .net, .gov, .org, .edu

Countries have 2 letter TLDs - .us (United States), .mx (Mexico), .uk (United Kingdom), .am (Armenia), .me (Montenegro), .ly (Libya), .tv (Tuvalu)

If I cannot remember a phone number...

TLD – Top Level Domains – highest level of the Domain Name System

Generic TLDs – Began in 2005 with [ICANN \(Internet Corporation for Assigned Names and Numbers\)](#)

In 2012, companies were allowed to submit for ownership of potential gTLDs. Currently, over 250 now in existence including .club, .ninja, .cool, .wtf, .democrat, .gop, .republican

Translate Domain to IP

Having Domain Names is important for readability and the ability to remember an address. However, we need to translate Domain Names to IP Addresses

Domain Name System - An Internet-based system that translates (people-friendly) domain names into (computer-friendly) IP addresses and vice-versa

Domain Name Servers – Devices that translates Domain Names into IP Addresses to facilitate proper routing on a network

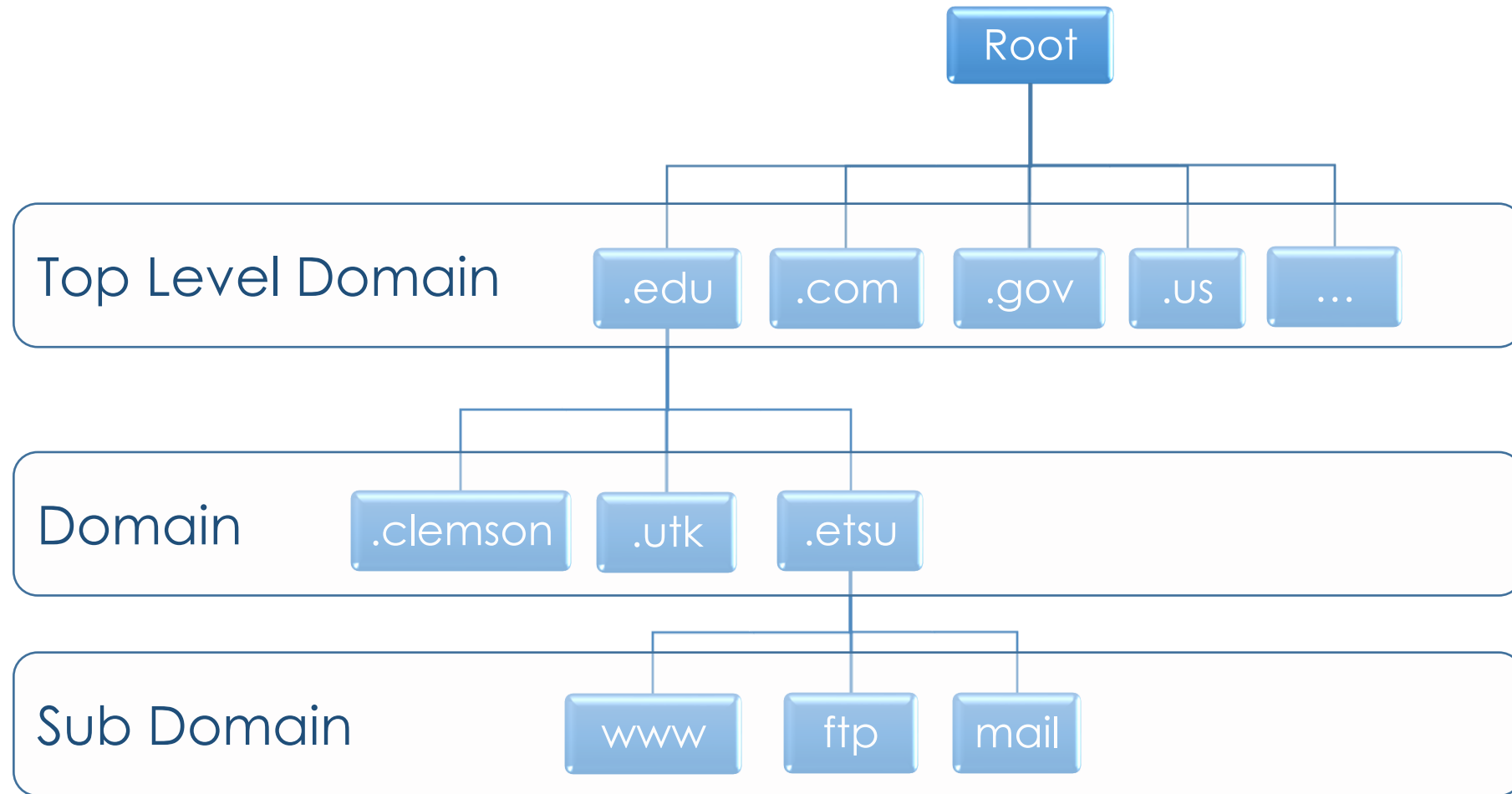
Translate Domain to IP

Having Domain Names is important for readability and the ability to remember an address. However, we need to translate Domain Names to IP Addresses

Subdomain – a subdivision of a domain that helps with logical grouping of computers/services (e.g., 'www' - which is where web-related servers are located)

URL (Uniform Resource Locator) – a unique name or address for every document or data element on the World Wide Web

Domain Name System (DNS)



Parts of a URL

<http://www.csci1210.com/labs/lab1/index.html>

http:// - Protocol

www. - Sub Domain (default is www. Others include MAIL.etsu.edu, ELEARN.etsu.edu, GOLDLINK.etsu.edu, etc)

csci1210.com - Domain we are connecting with (specifically .com is the TLD)

/labs/lab1/ - This represents the folder directory on the specific server that you are connecting with

index.html - This is the specific file that you are requesting from the server

But Wait...

What happens when you simply type in “csci1210.com”?

It will direct you to this particular page –

<http://www.csci1210.com/index.php>

But Wait...

Modern browsers and servers will make some assumptions if the information is missing:

- × If no protocol is listed, the browser will default to **http://**
- × If no subdomain is listed, the server will potentially default to **www.**
- × If no folders are listed, the server will default to the root folder (**/**)
- × If no file is listed, the server will look for the default files on the server (index.html, default.html, index.aspx, default.aspx, **index.php**, default.php)

In this example, **csci1210.com** will redirect you to the above URL

Protocols

HTTP (Hypertext Transmission Protocol) – This protocol specifies the transmission and receipt of hypertext pages (web pages) over a network

HTTPS (Hypertext Transmission Protocol Secured) – Similar to HTTP but secures the transmission of data

FTP (File Transfer Protocol) – This protocol specifies the transmission and receipt of files over a network

(More) Terms

Hypertext – “Linked” text (or images). Allows users to click on text (or images) in a document to take them to other documents and resources

Servers – Powerful machines whose primary role is providing information to other machines (usually many simultaneous requests). This machine waits for a request for information. Once it receives a request, it retrieves the information, performs any processing needed, and sends the data back to the requesting client computer

(More) Terms

Client – This is the end user's computer that interacts with the server

Directory – The structure of files and folders on a drive

Path – The location of a file in a directory

Document root directory – The 'top level' directory for a site



1

When you connect to the web, you do so via an Internet Service Provider (ISP). You type a domain name or web address into your browser to visit a site; for example: google.com, bbc.co.uk, microsoft.com.

2

Your computer contacts a network of servers called Domain Name System (DNS) servers. These act like phone books; they tell your computer the IP address associated with the requested domain name. Every device on the web has a unique IP address; it is like the telephone number for that computer. Traditionally these were numbers of up to 12 digits separated by periods/full stops but they are now being updated to sets of up to 32 characters.

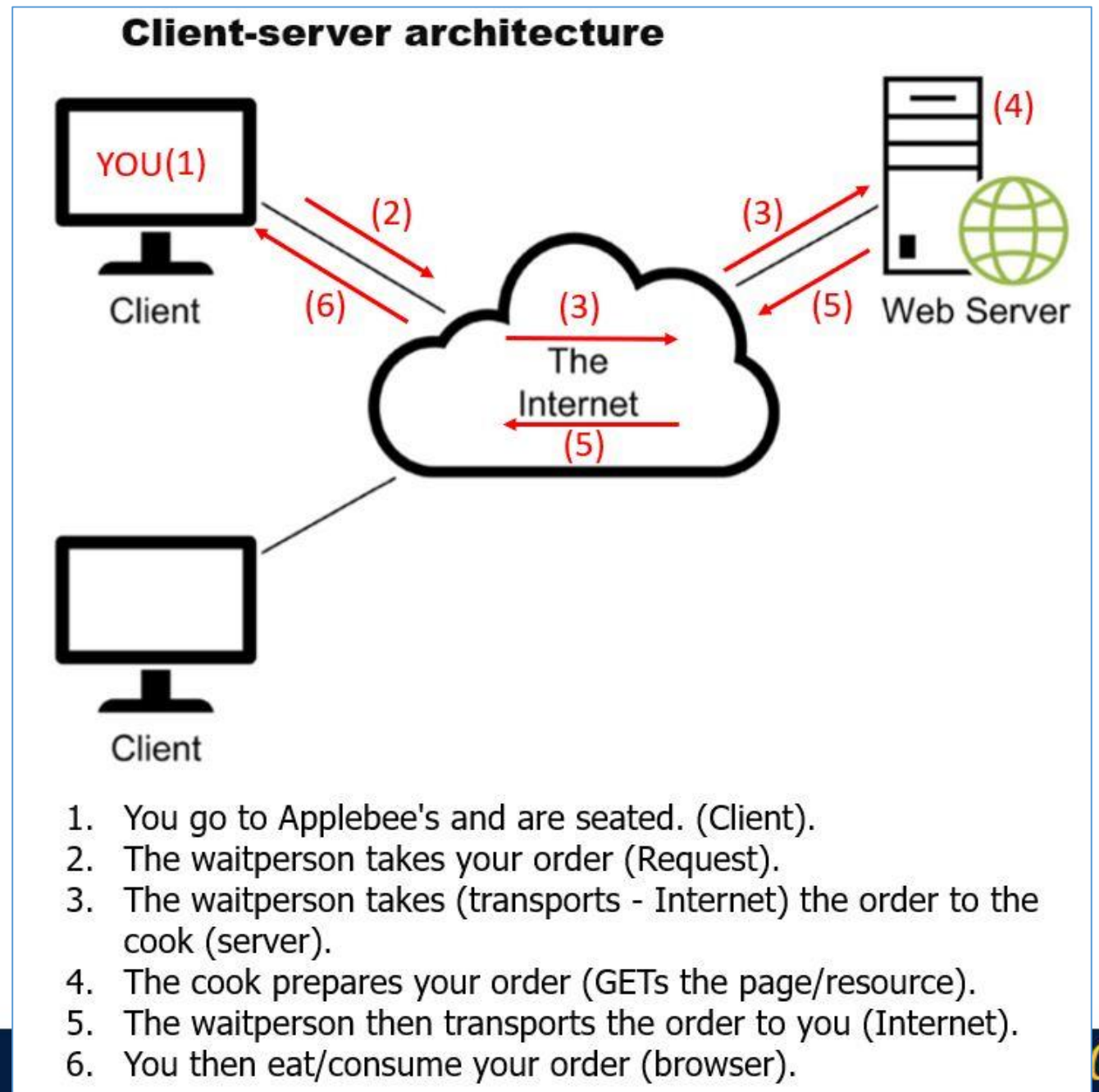
3

The unique number that the DNS server returns to your computer allows your browser to contact the web server that hosts the website you requested. A web server is a computer that is constantly connected to the web, and is set up especially to send web pages to users.

4

The web server then sends the page you requested back to your web browser.

(More) Terms Client/Server Architecture



Terms (sigh)

Browsers – Browsers are software applications that run on a client machine that displays the web page

The browser is the application that makes the request to the web server

Once it receives the requested file, it will process the file

It may also execute any client side “scripts” (i.e. JavaScript)

Display the file for the user to view

Examples include Internet Explorer, Google Chrome, Mozilla Firefox, Opera, Apple Safari, etc

Terms (sigh)

HTML (Hypertext Markup Language) – HTML is considered the language of the web

It is the language used to create the structure of web pages utilizing “tags” or “elements.” These elements are interpreted by the browser and displayed on the screen for end users

CSS (Cascading Style Sheets) – CSS is the way we add style (color, layout, fonts, etc) to our web pages

Summary of Terms

Internet

World Wide Web

Protocol

Hypertext Transfer Protocol (HTTP)

Hypertext Transfer Protocol Secured (HTTPS)

File Transfer Protocol (FTP)

Uniform Resource Locator (URL)

Internet Protocol (IP)

Domain Names

Domain Name System

Top Level Domains (TLDs)

Hypertext

Server

Client

Client/Server Architecture

Browser

Hypertext Markup Language (HTML)

Cascading Stylesheets (CSS)

Directory

Document root directory

Path

Bug / Debug

Summary Summary

- ✓ A web application uses an architecture that consists of clients, a web server, and a network. Clients use web browsers to request web pages from the web server. The web server returns the requested pages
- ✓ To request a web page, the web browser sends an HTTP request to the web server that includes the name of the requested file. Then, the web server retrieves the HTML for the requested web page and sends it back to the browser in an HTTP response. Last, the browser renders the HTML into a web page
- ✓ A static web page is a page that is the same each time it's retrieved. The file for a static web page has .html or .htm as its extension, and its HTML doesn't change
- ✓ HTML (HyperText Markup Language) is the language that defines the structure and contents of a web page. CSS (Cascading Style Sheets) is used to control how the web pages are formatted (more on that later...)

Summary Summary

- ✓ To deploy a website on the Internet, you need to transfer the directories and files from your computer web server with Internet access. To do that, you can use an FTP program that uses File Transfer Protocol
- ✓ To see a website, you can enter the URL (Uniform Resource Locator) of the site's directory into a browser's address bar. Then, the server looks for the default file in that directory and runs it. If it can't find a default file, the server displays an index of the subdirectories (unless its sysadmin is smart and blocks it)
- ✓ To view the HTML for a web page, you can use your browser's **View Page Source** or **View Source** command. This can be useful when you want to see whether the PHP application generated the correct HTML
- ✓ To develop web pages, you only need a text editor like Notepad++, Brackets, Sublime, or TextWrangler

INTERMISSION

Next Up: What is Web Design?

What is Web Design?

What is web design?

Effective and successful websites don't just happen

In order to better ensure success, a methodological approach, based on research and experience is required

Modern web development is highly competitive

An effective website can make or break an organization

What is web design?

Web design is a bit of...

Graphic design

“how the page looks”

Interface design

“how the page works”, method for doing things – links, buttons, etc.

Information design

“organization of the content, how you get to it”

What is web design?

Web design is a bit of...

Code production

“HTML coding”, using editors/editing software

* note on IDEs

Programming

advanced web functionality, forms, interactivity, working w/databases

Multimedia

producing/adding sound, video and animation to a site

What is web design?

Web design is a bit of...

Testing

Ensuring the final product meets the clients' and users' needs

Promotion / Marketing

Attracting users to the site; 'selling' the site

Search Engine Optimization

Designing the site so that it will rank high in search engine results

What is web design?

Web design is a bit of...

Maintenance design

Designing so that the site can be easily updated

Errors can be quickly addressed and rectified

Others?

Can you think of other concerns that come into play when designing a website?

Need for Design Methodology

Web sites exist to be used by people

Not all people have same goals, abilities, equipment, etc

Sites that are not used are not effective

To promote use, web sites must be, well, **usable**

Usable web sites are designed to *meet the needs of targeted site users*

By understanding our *site users*, the *principles of usability*, and *how to use technology*, we can create an attractive, usable, commercial web site

Usefulness and Usability

A **useful** system can be **used by a real person** to achieve a **desired goal**

Usefulness has two facets:

Utility: can the desired goal be accomplished? is the outcome correct?

Usability: how well can users use the system? is it confusing? frustrating? unclear?
ugly?

Useful does not mean *boring*. Useful means it is fit for the purpose it was intended

Content

Is it suitable for the targeted audience?

Use of graphics/sound/multimedia appropriate?

Structured appropriately?

* Ongoing process – must be considered throughout the process

Usability Elements

Functionally correct

Efficient to use

Easy to learn

Easy to remember

Error tolerant

Subjectively pleasing

Usability Elements

Functionally correct

Do the page controls work as intended

Do images display correctly?

Do links work? Are outside links still to active resources?

If things don't work, it is hard to establish **trust**

What do we mean by 'trust?'

Why is trust important?

Usability Elements



Efficient to use

Can user easily find what they are looking for?

Can user accomplish desired tasks with ease?

Think of users as always being in a hurry. They don't want to have to figure things out and click repeatedly to find what they want

Usability Elements

Easy to learn

Must be able to “instantly” discern functionality

Distinct from software that is learned over time



Usability Elements



Easy to remember

"How can I find this quickly in the future?"

"Where was that page that had the information I needed before?"

Sure, users can bookmark pages for later retrieval, but you, the developer, can't count on them to remember to do that

Usability Elements

Error tolerant

“Oops. I mistyped my Visa number!

User enters wrong password

“I missed a required field. Now I have to redo the whole form!”

This issue is particularly noticeable with forms. But any time you're soliciting user input, you also have to plan for users making mistakes. Or worse (what could be worse??)



Usability Elements

Subjectively pleasing

Does it look good?

Appropriate for audience? (Harleys vs. Handbags)

How the site looks and whether it is subjectively pleasing are dependent on the site's users. Part of the Design process is learning users' likes/dislikes/interests/needs/goals/etc and applying that knowledge to the design (more, much more on that later)



Usability Elements

Bottom Line

Usability means a person of average ability and experience can figure out how to use the site to accomplish what they want without it being more trouble than it is worth

How users judge a site

You'll find a lot of different definitions of usability, often breaking it down into attributes like

Image Useful: Does it do something people need done?

Image Learnable: Can people figure out how to use it?

Image Memorable: Do they have to relearn it each time they use it?

Image Effective: Does it get the job done?

Image Efficient: Does it do it with a reasonable amount of time and effort?

Image Desirable: Do people want it?

How users judge a site

Bottom Line: Usability Means

A person of average (or even below average) ability and experience can figure out how to use the thing to accomplish something without it being more trouble than it's worth

What Website Users Want

- ✓ To find what they're looking for as quickly and easily as possible
- ✓ To get information or complete a task with minimum fuss
- ✓ Not to have to deal with errors
- ✓ To be able to use/navigate a site without too much head-scratching

How Users Use a Site

- ✓ They scan the page to find what they're looking for or a link to what they're looking for, and they don't like to scroll. If they get frustrated, they leave
- ✓ They often click on links and buttons with the hope of finding what they're looking for, and they frequently click on the Back button when they don't find it
- ✓ Usually land on a site for a specific reason

How Users Use a Site

- ✓ Scan page(s) to find what they want
- ✓ Don't like to scroll
- ✓ Will often scan for links that appear to meet their needs; back-click if the link doesn't
- ✓ Will get frustrated quickly
- ✓ Will leave the site when frustrated

Enhancing Usability

- ✓ Present as much critical information as possible “above the fold” so the user has to scroll less
- ✓ Group related items and limit the number of groups on each page
- ✓ Include a header that identifies the site and provides a navigation bar and links to utilities
- ✓ Use current navigation conventions, like including a logo that goes to your home page when clicked and a cart icon that goes to your shopping cart when clicked, previous/next arrows, etc

Can only hit a known target

To create sites usable to and used by people, we must design with **those specific people** in mind

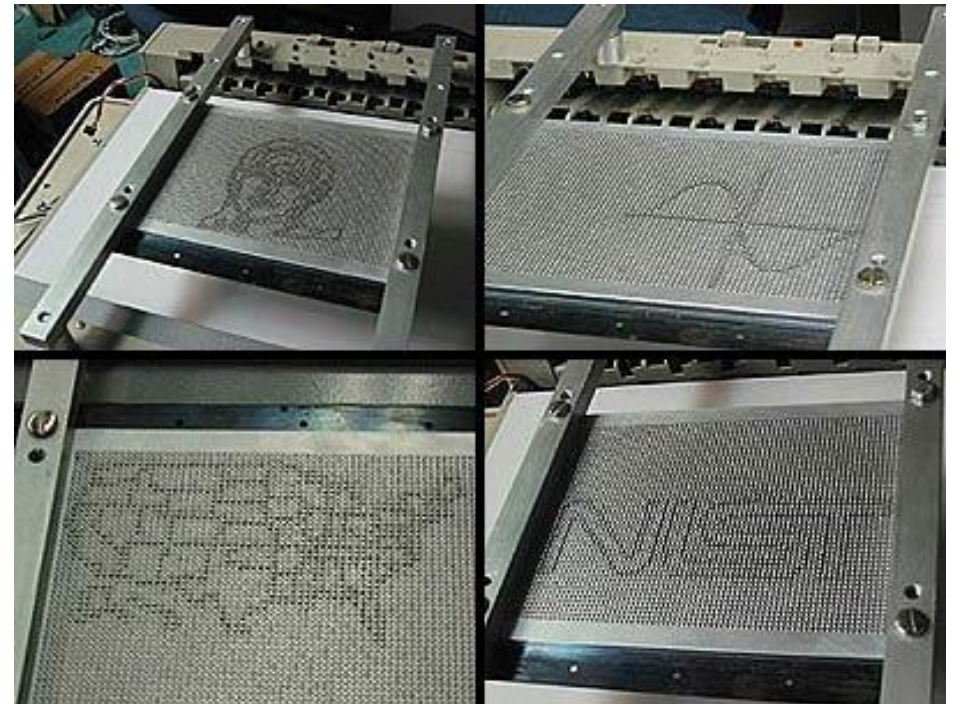
We must...

Understand what interfaces the user needs

How can we best present our functionality?

Do users have special needs?

See: <http://aboutwebaccessibility.com/home/inaccessible>



Can only hit a known target

To create sites usable to and used by people, we must design with **those specific people** in mind

We must...

Understand who the users are

Who would use this site? What type of person?

Can we list groups?

Develop user profiles?

Understand what the user is trying to achieve

Why are they coming to this site?

What do they want to accomplish?



Can only hit a known target

To create sites that people will use, you must design with **those specific people** in mind

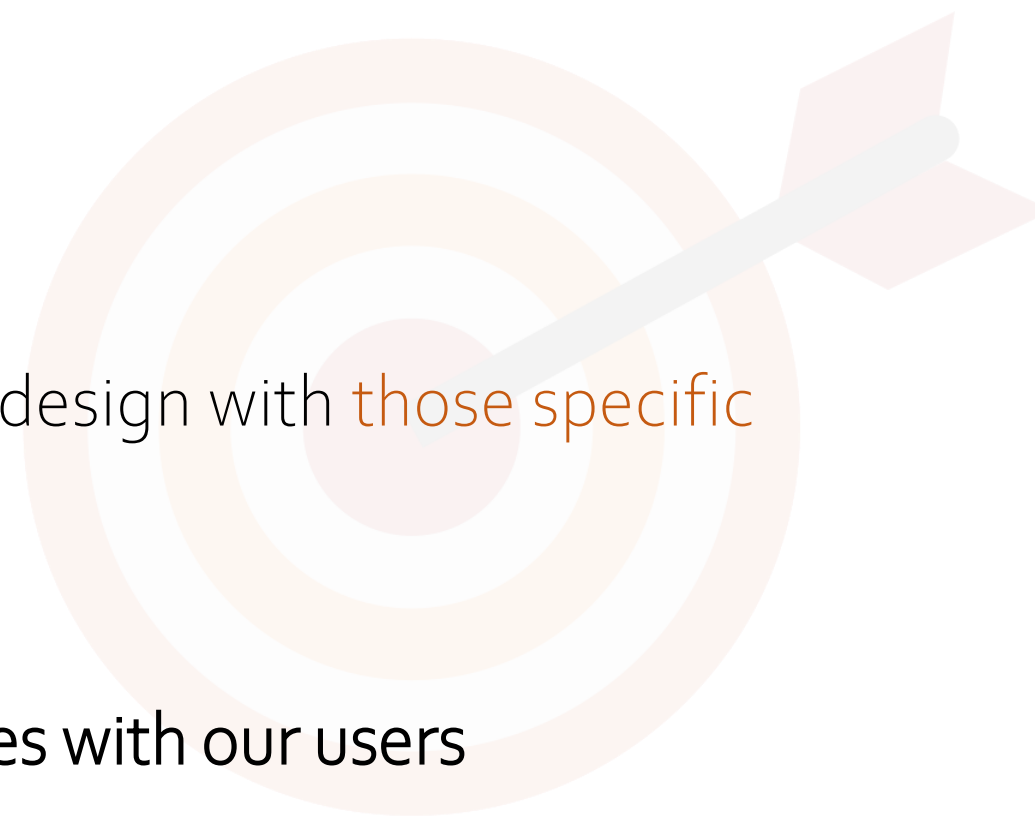
We must...

Test our initial ideas and interface prototypes with our users

Brainstorm and present many ideas

Have real users help us decide

Understand how users think



Can only hit a known target

To create sites that people will use, you must design with **those specific people** in mind

We must...

Test our “final” interfaces with our users

Until we gain specific experience, we don't know what our users will be comfortable with

You, the developer, are **not** a typical user



User-Centered Web Development Life Cycle

Stage 1: Define the mission and target user population

Stage 2: Collect user requirements

Stage 3: Create and modify conceptual design

Stage 4: Create and modify physical design

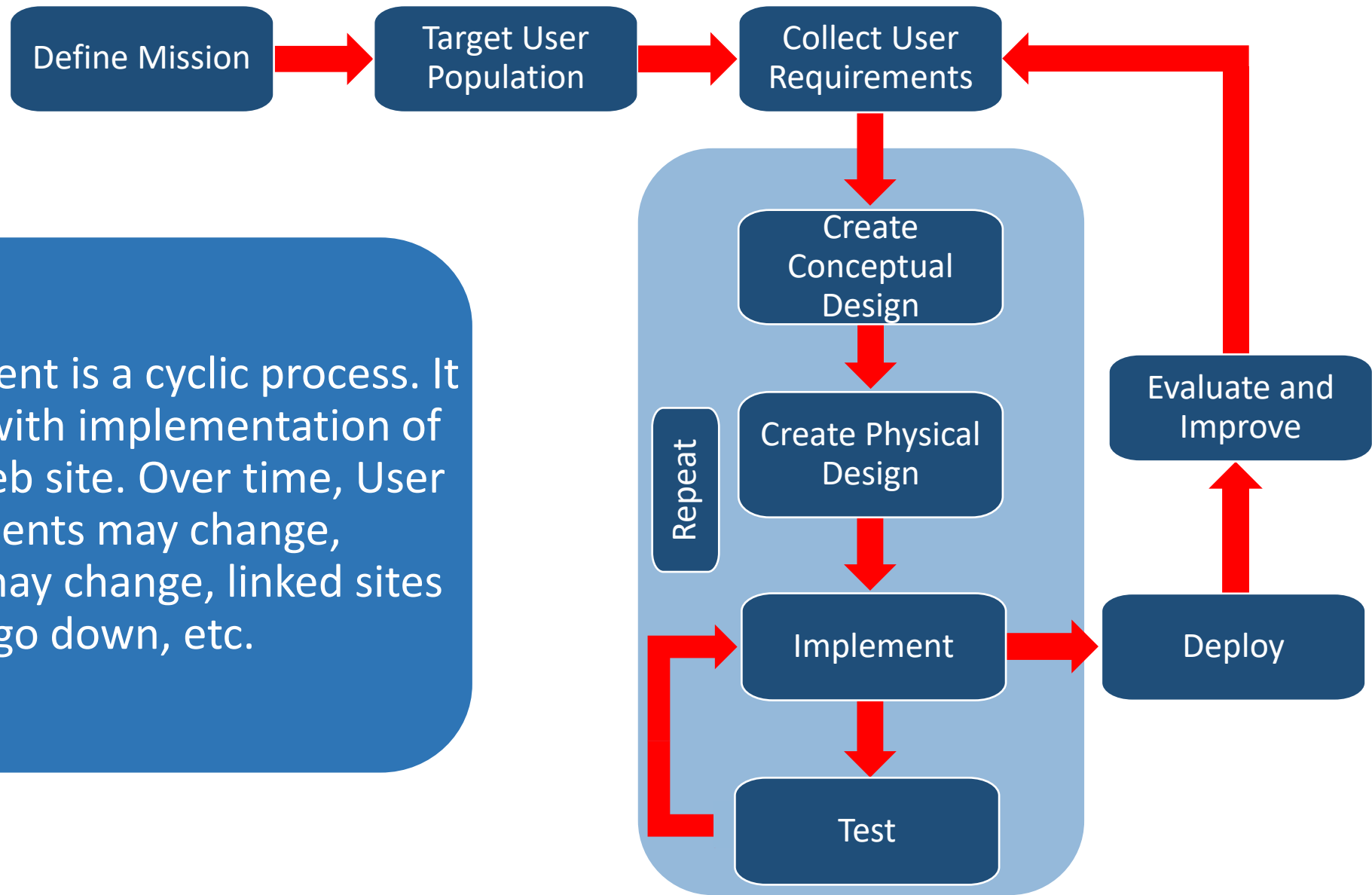
Stage 5: Perform usability testing

Stage 6: Implement and market Web site

Stage 7: Evaluate and improve Web Site

**Repeat
cycle
as
needed**

Web Development is a cyclic process. It does not end with implementation of the finished web site. Over time, User Requirements may change, technologies may change, linked sites may go down, etc.



Design Summary

Effective web sites don't just happen

Serious and methodological effort must be applied to

- a. Identify the site's mission (its raison d'etre)
- b. Use design principles to create a product that meets users' needs
- c. Test and evaluate the product
- d. Deploy the product
- e. Maintain and update the product over time

A website can make or break a client's organization/business

Remember:

A website can make or break a client's
organization/business

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

1. Which came first?
 - a. The Internet
 - b. The World Wide Web
 - c. Tim Berners-Lee
 - d. File Transfer Protocol

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

2. How old is the Internet?

a. 20

b. 35

c. 52

d. 42

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

3. What do we think of as the Internet's equivalent to a telephone number?
 - a. MAC address
 - b. Social Security Number
 - c. ZIP code
 - d. IP address

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

4. What is a unique name or address for every document or data element on the?
 - a. URI
 - b. URL
 - c. Domain name
 - d. a. or b. above
 - e. None of the above

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

5. Given the following URL, what represents the path?

`'https://www.csci1210.com/labs/lab5/images/favicon.png'`

a. `https://`

b. `https://www`

c. `csci1210.com/labs/lab5/images/favicon.png`

d. `csci1210.com`

e. `/labs/`

f. `/labs/lab5/images/favicon.png`

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

6. Which protocol should you be sure to use when you're checking your account balance at the bank?

- a. HTTP
- b. FTP
- c. HTTPS
- d. SMTP

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

7. What is the name of the architecture that is used by the World Wide Web?
 - a. Peer-to-peer
 - b. Client/Server
 - c. Publisher/Subscriber
 - d. One-to-many

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

8. Which of the following is an example of Web client software?
- a. Chrome
 - b. Firefox
 - c. FileZilla
 - d. Internet Explorer
 - e. Opera
 - f. Safari
 - g. Everything but c.

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

9. (T/F) Designing an effective commercial website is a fairly trivial exercise
- a. True
 - b. False

Lecture Quiz

Answer the following questions. Record your answers in a Word document and upload the document to D2L – ‘Lecture Quiz 1’:

10. Which of the following are some of the design considerations associated with Web Design?
 - a. Graphic design
 - b. Interface design
 - c. Information design
 - d. HTML production
 - e. Programming
 - f. Multimedia
 - g. All of the above

Lecture Quiz

Your uploaded file should look something like this (and, no, the answers in this screen shot are not necessarily the correct answers to the quiz!):

1. A
2. D
3. F
4. C

Next

Introduction to HTML

Lab 0 (Intro to Tools)

Lab 1 (Maybe - Intro to HTML)

Homework 1 – The Good, the Bad, and the Ugly

Sources

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