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|  | Concept Assignment 6  PLTW Computer Science CSP Core Training |

# The Internet

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|  | Learning Objectives |

LO6.1 While working through the content of Activity 2.1.3 Protocols and Bandwidth, the teacher will:

* Define the term *protocol*, in terms of its use in both an interpersonal context and in computing, drawing comparisons and highlighting differences between the two usages.
* Specify the three most widely used internet-specific protocols referenced in the activity and summarize the role of each.
* Use a set of internet protocol (IP) BASH command line utilities to obtain specific information regarding the transmission of data packets around the internet.
* Describe, in general terms, how the internet’s infrastructure moves information from point A to point B, including such concepts as Domain Name Servers (DNS), IP addresses, routing, and data packets.
* Recognize how the internet incorporates redundancy, delegation, and recursion to produce a system that is resilient and robust.
* Differentiate between latency and bandwidth.
* Cite at least three international organizations (and their associated acronyms) responsible for aspects of internet governance and discuss the role and responsibilities of each.

LO6.2 While working through Activity 2.1.4 HTML and CSS, the teacher will:

* Produce a basic web page containing a table.
* Understand and apply the fundamental syntax of cascading style sheets (CSS).
* Create a table in HTML that is styled by inline, internal, and/or external CSS.
* State the purpose of the Document Object Model (DOM).
* Differentiate between absolute and relative path names, create directories, list directory content, and navigate through directories using UNIX commands from the BASH command line.

LO6.3 While working through Activity 2.2.1 HTML 5 and JavaScript, the teacher will:

* Add JavaScript® functionality to an HTML page using a code snippet procured from the Web.
* Identify sections of JavaScript code within a web page that perform a specific task.
* Consider principles of human-computer interaction (HCI) when designing or evaluating a website.
* Differentiate between HTML code viewed in a text editor versus that rendered by a browser.
* Identify HTML tags used to create visual elements rendered in a browser.
* Specify code segments in a web page that use JavaScript, HTML, or CSS.
* Modify existing JavaScript code in a web page to accomplish a specified task.

LO6.4 While working through Activity 2.2.2 Introducing *PHP*, the teacher will:

* Memorize basic PHP syntactical elements and basic operators.
* Analyze the functionality of a given PHP code segment.
* Examine and interpret official PHP documentation.
* Modify example PHP code to meet design specifications.

LO6.5 While working through Activity 2.2.3, the teacher will:

* Create database tables and insert, select, and perform queries on those tables using Structured Query Language (SQL).
* Define and apply the concept of normalization to a data set.

LO6.6 While working through Activity 2.2.4, the teacher will:

* Apply what has been learned about HTML, CSS, PHP, and MySQL in the activities of Lesson 2.2 to the creation of a data-driven website. The design phase will integrate principles of HCI and Scrum, and the project specifications will require version control and appropriate documentation.

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|  | AP CSP Enduring Understandings (EU) and Learning Objectives (LO) |

* The Internet is built upon hierarchical, redundant systems that use abstractions, such as the DNS and IP protocols. EU6.1 through LO6.1.1 [P3], EU6.2 through LO6.2.1 [P5] and LO6.2.2 [P4], EU6.3 through LO6.3.1 [P1], and EU2.2 through LO2.2.3 [P3].
* The internet has profoundly affected how people interact. EU7.1 through LO7.1.1 [P4].
* The internet affects and is affected by governmental and non-governmental organizations. EU7.4 through LO7.4.1 [P1].
* Analyzing a program requires identifying blocks of code that function together. EU5.4 through LO5.4.1 [P4].

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|  | Introduction |

It’s commonplace to hear people speak of the internet and Web interchangeably, as if the two are synonymous. This unit will help you clearly differentiate between the two. While the internet is a massive network of networks, built as an infrastructure of electronic devices and numerical paradigms, the World Wide Web is an information-sharing platform built on top of that infrastructure. This information-sharing platform, which we will refer to simply as “the Web”, uses specific protocols (rules of operation) to ensure the dependable exchange of information between people and machines.

Much of the information shared on the Web is received by browsers, which are software programs residing on client machines. Those browsers render code sent to them by servers. The technologies and processes involved in the composition and translation of code by browsers can be lumped into one big category called “web development”. This unit addresses all three components mentioned above: the infrastructure of the Web, protocols, and several fundamental aspects of web development.

### The Internet and the Web: Infrastructure and Protocols

**Protocols describe what to do and** **when to do it**. Students who want to understand how computer networks work will appreciate these concepts. This topic also has social dimensions that can make it interesting for students. Social protocols are important for humans to work together. Similarly, computers need protocols to be networked together.

This course touches on several protocols, including those that are conceptually less important, such as internet control message protocol (ICMP). The broader concept is that protocols are decided upon and revised by people and are a compromise between competing demands, such as security and speed. Students should have a high-level understanding of **three** distinct topics:

* Transmission control protocol/internet protocol (TCP/IP) suite
* Domain name system (DNS) concepts
* Hypertext transfer protocol (HTTP) communication

Throughout Unit 2, PLTW Computer Science Principles uses the Cloud9 IDE. Your Master Teacher will send you an invitation to create a Cloud9 account. After you’ve created a Cloud9 account through a link in the invitation, you will also create a team for use in your classroom through this link:  
<https://www2.pltw.org/e/82012/team-new-plan-PLTW/3964x3/247643100>

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|  | Part 1: Review the Student Learning Sequence for Lesson 2.1 |

### Lesson 2.1 Student Learning Sequence

#### Activity 2.1.1 The Rise of the Internet (2 days)

*Students will*…

* Describe the social impact of the Internet across society.
* Describe the Internet in terms of packets and routers.
* Describe the hierarchy of IP and DNS addressing.
* Evaluate information from the Internet.

#### Activity 2.1.2 Your Favorite Web Page (1 day)

*Students will*…

* Assess a website for accessibility and universal design.
* Describe the client-server relationship.
* Parse and infer information from a URL.
* Describe search engines, query strategies, and the impact of geopolitical location and search history on search engine results.

#### Activity 2.1.3 Protocols and Bandwidth (2 days)

*Students will*…

* Investigate information technology (IT) careers and identify organizations that create IT protocols.
* Describe the protocols of human introductions, TCP/IP, and DNS.
* Describe latency and bandwidth.

#### Project 2.1.4 HTML and CSS (3 days)

*Students will*…

* Navigate directories and edit files on a Linux machine.
* Transfer files by FTP.
* Describe a tree of document elements with HTML tags: <h1>, <a>, <img>, and <table>.
* Explain that CSS stylizes web content by applying a cascading set of rules with increasingly specific scope.

1. Read through the activities listed above and become familiar with the ideas and concepts in each of the activities. Pair-share or jigsaw in groups of three or four and match the AP Enduring Understandings and Learning Objectives with their corresponding activity.
2. Work through Activity 2.1.3 Protocols and Bandwidth and experiment as directed with the utilities that allow you to examine the infrastructure of the internet using web protocols.

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| Submission Item |
| 1. Complete questions 15, 17, 19, and 22. |

### Overview of Web Development in the Course

If one examines the evolution of the Web, in particular how web pages and websites have changed over time, those changes would follow a simplified sequence: static text, styled text and formatted content, interactivity, and finally the use of dynamic data. These changes have been brought about through the development and application of specific technologies: Hypertext Markup Language (HTML) tags for static elements such as text and images, Cascading Style Sheets (CSS) for styling, JavaScript® for interactivity, and PHP/MySQL for dynamic, data-driven websites. We will examine these technologies and particulars of implementation.

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|  | Part 2: Review the Student Learning Sequence for Lesson 2.2 |

### Lesson 2.2 Student Learning Sequence

#### Activity 2.2.1 HTML5 and JavaScript (3 days)

*Students will*…

* Explain the relationships among HTML, CSS, and JavaScript.
* Describe how web languages are evolving standards.
* Use a few constructs of JavaScript including short-circuit logic, event handlers, and manipulation of the HTML document (DOM).

#### Activity 2.2.2 Introducing PHP (3 days)

*Students will*…

* Understand the role of PHP and SQL among the web languages.
* Draw parallels and contrasts between *Python*® and PHP to generalize about commonalities and differences among programming languages.

#### Activity 2.2.3 Databases and SQL (2 days)

*Students will*…

* Normalize a database so that information for each entity exists only once in the database.
* Construct a query to retrieve data from a SQL database.

#### Problem 2.2.4 Dynamic Data-Driven Design (4 days)

Students will… Define, design, develop, and present a data-driven website of interest to a client.

#### Activity 2.2.5 Career Fields of CS and IT (1 day)

*Students will*… Gather and present information about a subfield of computer science and information technology.

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|  | Part 3: HTML and CSS |

1. Work through Activity 2.1.4 to create a basic web page named “index.html” that contains a link to another page called “ice.html”. This page holds a table of ice cream flavors and uses an external Cascading Style Sheet to style that table.

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| Submission Item |
| 1. Activity 2.1.4: Submit screenshots of **index.html** and **ice.html**, both HTML code and browser render. |

1. Using the file 221indexB.html in Activity 2.2.1 as your guide, modify the JavaScript code to duplicate the pop-out code so that three thumbnails pop out in the same manner as the first.

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| Submission Item |
| 1. Activity 2.2.1: Submit screenshots of **221indexB.html**, both HTML code and browser render. |

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|  | Part 4: PHP |

Activity 2.2.2 compares an HTML/JavaScript implementation of a particular functionality with a PHP-driven one. A key PHP function, display\_table(), needs to be altered to fix three small problems.

1. Work through the activity with an eye on building a new version of 222indexB.php that solves these problems.

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| Submission Item |
| 1. Activity 2.2.2: Submit screenshots of **222indexB.php** and **222popouts.js**, both code and browser render (just relative portions). |

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|  | Part 5: Databases and SQL |

1. To create and use the database and the tables it contains, Activity 2.2.3 must be followed to the letter. Step 24 asks you to complete two of three possible tasks, and any omission of previous steps will result in an error. (As you work through the activity, pay particular attention to the relative importance of semicolons while recognizing the relative unimportance of capitalization.)

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| Submission Item |
| 1. Activity 2.3.3: Submit screenshots of tables created and contents and **223index.php** or **223indexAlt.php**, both code and browser render. |

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|  | Part 6: Classroom Implications |

1. It’s quite common for programmers to search for solutions to common programming problems on the Web and then “borrow” those solution for their own use.

Will you consider such actions by your students as plagiarism, or in legal terms, copyright infringement? Why or why not? Will you address such behavior at the beginning of the school year? How will you address it?

1. It is said that imitation is the sincerest form of flattery. As suggested in the question above, solutions to programming problems can be discovered by a simple web search.

Should such efforts be actively encouraged? If so, what tips, tricks, and resources can you, as the teacher, provide to leverage such activity so as to promote the greatest learning?

1. Most of the activities in Lesson 2.2 involve examining code and trying to make sense of small portions of a complete document. To the novice, the task can be daunting; the entire page may appear as one big blob. This task can be made easier if the reader understands subtle structural elements, such as syntactical elements (braces and semicolons, for example), key words, function definitions, calls, comments, and color-coding of text in an editor such as Notepad++. Cloud9 is a fantastic site for working with web technologies, but the lack of color-coding may be a disadvantage.

Copy and paste one of the PHP files used in Activity 2.2.2 and save it using a php extension (for example, 222indexB.php). Reflect on whether or not the color-coding could impact the understanding of a novice trying to learn PHP.

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| Submission Item |
| 1. Write a reflection about the things you learned today. Consider highlighting new things you’ve learned, items you need to consider for implementing this in your classroom, and ideas and suggestions you’ve heard from others. Use the questions in Part 6 of the assignment as prompts, but don’t feel limited or constrained by just those questions. |

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