# Unit 5 - Networking

Content Area: **Computer Science**
Course(s):
Time Period: **Marking Period 2**
Length: **3 Weeks**
Status: **Published**

## Brief Summary of Unit

This final unit begins by exploring the concept of a network, and builds up the rationale for the structure of the Internet as we know it today. Internet hardware is discussed, as are IP Addresses, DNS (Domain Name Service), fault-tolerance, packets, and protocols. The effect of the Internet on society is discussed in the unit as well, exploring the impact of the Internet on communication, community-supported causes, collaborative problem solving, "citizen science," distributed computing, e-commerce, access to information, online learning, GPS, and entertainment. Questions about the interplay between the Internet and (a) copyright, (b) anonymity, and (c) censorship are also discussed. The growth of the Internet has resulted in a "digital divide," which we then explore. The unit concludes with an exploration of network hacks and securing a network.

Revised November 2023

## Standards

- TECH.8.1.12.A.CS1
- TECH.8.1.12.A.CS2
- TECH.8.1.12.C.1
- TECH.8.1.12.D.2
- TECH.8.1.12.D.5
- TECH.8.1.12.D.CS1
- TECH.8.1.12.F.1
- TECH.8.1.12.F.CS1
- TECH.8.1.12.F.CS3
- TECH.8.2.12.B.CS1
- TECH.8.2.12.B.CS2
- TECH.8.2.12.C.1
- TECH.8.2.12.C.4
- TECH.8.2.12.E.2
- TECH.8.2.12.E.4

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| LA.K-12.NJSLSA.L4 | Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. |

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| LA.K-12.NJSLSA.L5 | Demonstrate understanding of word relationships and nuances in word meanings. |
| CS.9-12.8.1.12.AP.5 | Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. |
| CS.9-12.8.1.12.AP.6 | Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs. |
| CS.9-12.AP | Algorithms & Programming |
| CS.9-12.CS | Computing Systems |
| CS.9-12.DA | Data & Analysis |
| CS.9-12.EC | Ethics & Culture |
| WRK.K-12.P.5 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| WRK.K-12.P.8 | Use technology to enhance productivity increase collaboration and communicate effectively. |
| WRK.K-12.P.9 | Work productively in teams while using cultural/global competence. |

## Transfer

- In this unit, students examine the interaction between the Internet and society. A greater awareness of this relationship could help students to be more productive members of society, since they will learn that the Internet allows people to work together in ways that were previously impossible. As an example, there is a project called "FOLDIT" that invite people to play a game. This game is concerned with folding proteins, an important area of research in biology. By playing the game, students/people in general can recognize an ideal folding pattern, using their intuition in a way that computers currently cannot. By playing an online game, students could contribute to medical research.

## Essential Questions

- How does the decentralized nature of the Internet contribute to its robustness?
- How does the emerging IPv6 address schema help to ensure continued scalability of the Internet?
- How much data do you think is transmitted through the Internet every second? Every minute? Every Hour?
- What are some facets of society that the Internet has affected?
- What are the different components of a domain name?

## Essential Understandings

- A domain name is hierarchical. Each successive portion of the name reveals increasing specificity about the networks and subnetworks on which a web site is stored.
- Extremely large amounts of data are transmitted through the Internet
- IPv6 uses a hexadecimal scheme, allowing for many more possible IP addresses. This will ensure that we have enough IP addresses for the foreseeable future.
- The "digital divide" is a term that is used to describe the separation between people who have internet access, and people who do not. Mobile applications is one example of how to begin to bridge that divide.

- The decentralization of the Internet allows for multiple paths through which data can be routed. If some routes are damaged or if there is too much traffic, the data can be routed a different way to reach its destination.
- The Internet has affected communication, community-supported causes, e-commerce, GPS, entertainment, and many other facets of society.

## Students Will Know

- Some different kinds of network hacks such as “Distributed Denial of Service,” and “Packet Sniffing”
- The difference between IPv4 and IPv6
- The general structure of the Internet
- The role of protocols in the transmission of data through the Internet
- The role of the DNS in accessing information on the Internet
- What citizen science is
- What is meant by the term “fault tolerance”

## Students Will Be Skilled At

- Converting between decimal, binary, and hexadecimal
- Identifying opportunities to contribute to “citizen science”
- Identifying opportunities to join efforts utilizing “distributed computing”
- Identifying the various protocols that govern different aspects of data transmission on the Internet given a specific scenario
- Recommending network security enhancements to mitigate various security threats

## Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes and CodeHS.com, AP Classroom/Albert Checks for Understanding
- Summative: Teacher-created assessments/projects and CodeHS Computer Science Projects, AP Classroom/Albert Unit Assessments
- Benchmark: Check for understanding benchmark assessments on CodeHS, AP Classroom/Albert/Khan Academy Diagnostics
- Alternative Assessments: Student-centered activities such as a doorbell coding project, game design projects, and other activities involving real world applications

- Answer essential questions

- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

## Learning Plan

- Converting between decimal, binary, and hexadecimal
- DNS (Domain Name Service)
- Impact of the Internet on Society (consider exploring FOLDIT)
- Internet Addresses
- Internet Hardware
- Introduction to the Internet/Statistics about data transmission rates
- Packets and Protocols
- Possible guest speakers on topics such as distributed computing, citizen science, anonymity, and/or network security
- Routing
- Securing a Network
- Student presentations of any relevant current events
- Various Network Hacks

## Materials

Core instructional materials: Core Book List

Supplemental materials: CodeHS

- Computers
- Teacher created activiites
- Teacher created notes
- Website such as codehs.com for content
- Websites to research current events

## Suggested Strategies for Modifications

Possible accommodations/modification for Introduction to Cybersecurity