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| **Grade: 9 - 12** | **Unit: Networking** |
| **N1: Exploring IP Addresses using Network Traffic Packets** |
| **Topic:** * IP Addresses
* Server-Client relationship
 | **Materials:*** Class set of computers, with:
	+ Internet connection
	+ Ability to run command line/ terminal
	+ [Wireshark/tshark](https://www.wireshark.org/download.html) installation
	+ Modern web browser
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| **Science & Engineering Practices (SEPs)** | **Disciplinary Core Ideas (DCIs)** | **Crosscutting Concepts (CCs)** |
| * **Not applicable**
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| **APCSP Enduring Knowledge Standards:*** EK6.1.1A The Internet connects devices and networks all over the world
* EK6.1.1C Devices and networks that make up the Internet are connected and communicate using addresses and protocols.
* EK6.1.1E Connecting new devices to the Internet is enabled by assignment of an Internet Protocol (IP) address.
* EK6.1.1G The domain name system (DNS) translates domain names to IP addresses.
* EK6.1.1H The number of devices that could use an IP address has grown so fast that a new protocol (IPv6) has been established to handle routing of many more devices.
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| **Essential Question:** * How does a computer identify where to send a message on a network?
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| **Learning Target** | SWBAT contrast different IP protocols and recommend one for a particular network. |
| **Engage** | **(WEBSITES URLs HAVE EQUIVALENT NUMBERS)*** Students setup on laptops in small groups & log on.
* Instructions:
	+ Open a web browser (Google Chrome)
	+ Type the following URL and press enter:
		- 172.217.12.142 (Google.com)
		- 34.200.100.132 (ESPN)
		- 52.6.111.61 (McDonalds)
		- [104.193.88.123](http://104.193.88.123) (Baidu.cn)
		- [130.211.198.204](http://130.211.198.204/) (Disney error)
		- [31.13.71.37](http://31.13.71.37) (Facebook)
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| **Explore** | **(PING ACTIVITY)*** Students are given basic instructions about how to “ping” a website. [PING ACTIVITY]
* Student prompts:
	+ What is the average time it takes to ping Google.com?
	+ Try a different website that gives you a longer time.
	+ What do you think “ping” means?
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| **Explain** | * Elicit the following responses from students:
	+ “Ping” - send a message back and forth to someone (ie. ping-pong)
* Watch [Code.org video about IP addresses](https://www.youtube.com/watch?v=5o8CwafCxnU&feature=youtu.be)
* Draw on previous activity to come up with definitions for vocab:
	+ “server”
	+ “client”
	+ “IP Address”
	+ “latency”
* How many different IP addresses exist?
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| **Extend**  | **(IP ADDRESS VISUALIZATION TOOL)*** Open the tool
* Identify 3 websites
* Generate 3 different traffic patterns
* Determine which website goes with
* Determine which IP address goes with what website using nslookup
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| **Evaluate** | * Discussion with Students:
	+ How many different IP addresses can you make with 4 bytes?
	+ How many different IP address can you make with 6 bytes?
	+ Which is better: IPv4 or IPv6? Why?
* Exit Slip:
	+ Write 1 good reason to use IPv4.
	+ Write 1 good reason to use IPv6.
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| **Differentiation** | * Provide article “The Internet is Too Big” (2015) for students to read ahead of time to prepare them for the concepts
	+ <https://www.usatoday.com/story/tech/2015/07/03/internet-is-officially-too-big/29666003/>
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