CS 2600 Lab 2

Learning Objectives of this Lab:

1. Test how data rate and latency impacts application performance.

In this lab, there will be screenshots to take, data to record in a table, and questions that need answers. All the questions are numbered. In your lab report, include the associated number at the start of each answer.

It is preferred to connect to wired ethernet if possible. If you are using WiFi, It is critical that you have a good WiFi connection. To get the best WiFi connection, move close to the WiFi access point. If you don't know where the WiFi access point is, look at the signal strength indicator on your computer and move to a place where you have full bars. To get the most consistent results, it would be best to complete the lab all at once, using the same internet connection for the duration of the lab.

Real World Application Performance (Chrome Developer Tools Throttling)

For this next portion of the lab you will be creating throttling profiles in Google Chrome that purposefully simulate low performance network environments. While you can do this section of the lab on a network connection of any performance, you will get more dramatic results if you are connected to a decently high performance network. For example ~25Mbps download or higher, and ~100ms latency/ping or lower, according to the speedtest you performed earlier. If you need to switch networks now to something better, you are welcome to, but again, that is not required for completing the lab.

If you do not have Google Chrome installed, you can download it here: https://www.google.com/chrome/. You are also welcome to use a Chromium derivative such as Chromium, the new Microsoft Edge, Opera, Brave, or others. Some web browsers are not a Chromium derivative, such as Firefox and Safari, and those browsers are not supported by this lab. If you do choose another browser that isn't Google Chrome, you are responsible for figuring out how to complete the tasks when the browser you have chosen is different from Chrome. You may just want to use Chrome :)

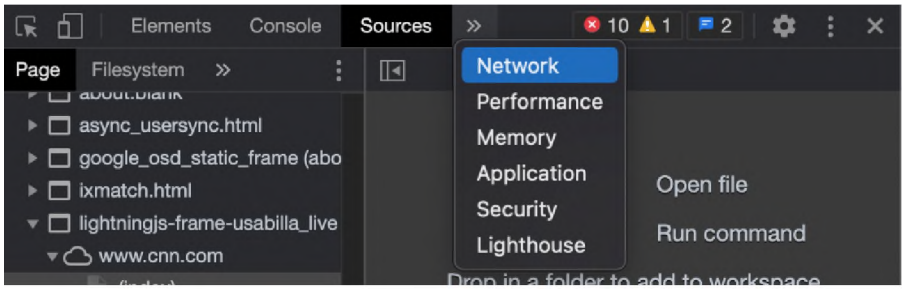
In Chrome, navigate to cnn.com. We are using cnn.com because it is a content heavy page, with lots of images and videos. Images and video are very large (in bits) compared to text, and take significantly longer to transmit in most situations. If you have a fast internet connection, for example 25Mbps or higher, this is negligible, because you would be able to download all of this content quickly. If your internet connection were slow, for example 1Mbps or slower, these graphical content heavy web pages will take a long time to load. As a developer, it is critical to think of others with slow internet connections, and consider testing page load times for people

with a wide variety of internet speeds. There are many tools that can do this for you and can even track page load times for your users in real time.

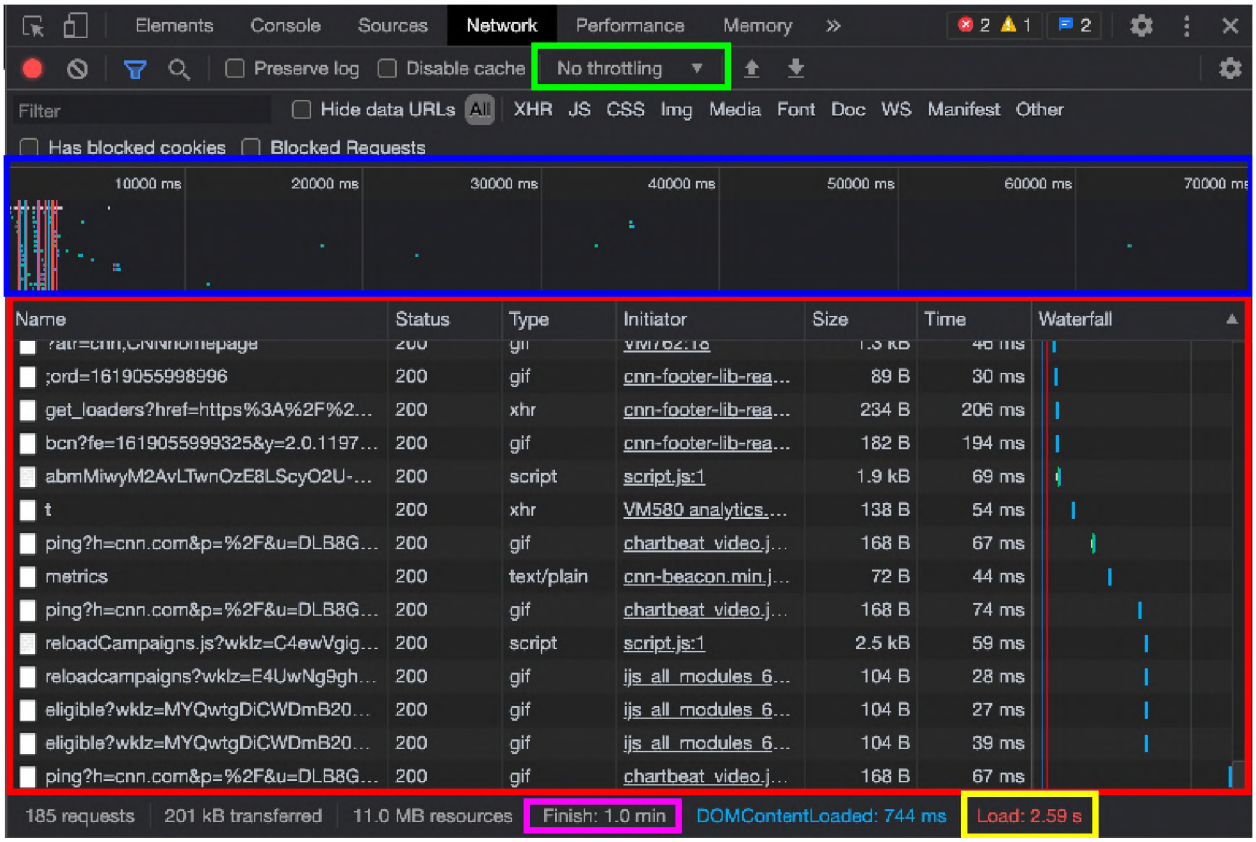
Latency also plays a factor in page load times. Many web pages make tens, if not hundreds of unique web requests for content. The higher the latency, the longer each of these round trip times take for each of these requests. And if the responses from the web server are large (in bits), then it will take a long time to receive the response, on top of that long latency round trip time.

Now to actually start doing things. Remember these instructions are for Google Chrome. While on cnn.com, open the developer tools by right clicking anywhere on the page and clicking inspect. You can also get to the developer tools by pressing F12. Do not close the developer tools while doing this portion of the lab. The developer tools window must remain open for this to work.

Once you are in the developer tools, navigate to the “network” tab. You may need to click an arrow drop down menu to get to the network tab as pictured here:



And this is what the network tab should look like:



Description of what each of these highlighted portions represent:

Green: The throttling menu. You can set throttling profiles that enable you to load the page with specific connection performance properties. You can change download and upload data rates, and add additional latency for each request.

Blue: Shows you each request that has been made on the chart, and you can see how long each of those requests took in a visual and easy way.

Red: Shows you each request that has been made by the web page, the status code returned from the server, the content type of the response of the request, the initiator, how big in bytes the response was, and how long the transaction to the server took to initiate and fully receive.

Magenta: The time from initial page request to the end of the last response from the web server. This number can keep going up over time if your web page keeps making requests to the server over time. Many web pages do this. We will not be using this number for our testing.

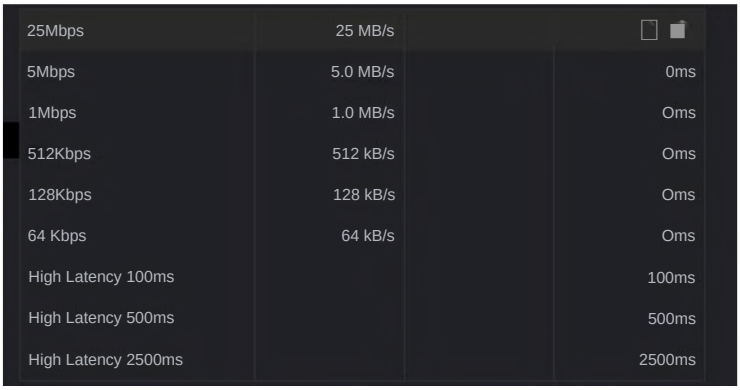
Yellow: The load time of the initial page load. This yellow box is a very useful box, because it represents the time the page took to initially load everything it needed to for the complete web page. This time does not include after the initial loading of the page requests to the web server like the magenta number does. This yellow “Load” time is the time we will be

using for our testing. While I have drawn a yellow box around the time, the text should actually be in red.

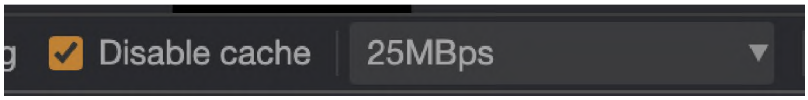
Click the Throttling drop down menu. Then click “add” under custom. This will take you to a new page where you can add new throttling profiles. We will be adding some custom profiles. You can add a profile by clicking “Add Custom Profile” and filling in the boxes. Note that some boxes are left blank intentionally. Here are the profiles you need to create:

Profile Name	Download	Upload	Latency
25Mbps	25000		
5Mbps	5000		
1Mbps	1000		
512Kbps	512		
128Kbps	128		
High Latency 100ms			100
High Latency 500ms			500
High Latency 2500ms			2500

Once all those are added, you should have something that looks like this:



Now what we are going to do is test loading cnn.com with each of these throttling profiles. Click the little x in the corner of the throttling window to navigate back to the network tab in developer tools. You should now see all of the throttling profiles you created in the throttling menu.



It is critical that “Disable cache” remains checked when doing these tests. Go check the box now. To load the page using a throttling profile, select the throttling profile from the drop

down box, then reload the page. You will see the numbers at the bottom. And be warned, once you hit about 1Mbps and slower, it can take minutes or longer for the red “Load” number to appear. Wait for this number to appear before reloading the page for the next test so you can jot it down. Perform the tests one at a time.

Here is what you need to do: For each throttling profile, test loading cnn.com two times, and record the page load time for each as represented by the “Load” time in red in the lower right corner of the network tab.

Include in lab report:

1. Include a table or spreadsheet of all the results of the page load times. This should be 8 rows by 2 columns for a total of 16 page load times.
2. What were some of the trends you noticed in regards to page load time related to the data rate or latency selected?
3. Out of the data rates and latencies tested, what feels like the minimum data rate to have a good experience using this site? What feels like the maximum latency to have a good experience using this site? At what point would a user be frustrated by long page load times?
4. What are some changes you could make as a developer to have better page load times for users with slower internet connections?
5. What kinds of web applications would be usable with a slow internet connection, for example, the 64Kbps or 128Kbps connection?

Some commentary I will add here is that thousands of people still use dial up, which has a maximum data rate of 56Kbps. And many people have cell phone data plans that throttle after a certain monthly allotment is used. Usually that throttling is about 64Kbps - 128Kbps. Many DSL plans offer speeds of 1Mbps or lower. Many satellite internet plans offer low data rates and high latencies. Over time these statistics will change, and internet connections will be faster in more places. But for now, it is important to consider those that have a slower connection when creating a web application.

Summary of Deliverables:

- Answers to questions 1 - 5, and any information and screenshots required.