[HTTP Resources](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live)

[Scott Allen: Hi, this is Scott Allen and this module is the first module](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=1.436) [in a series describing the Hypertext Transfer Protocol or what we call HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=4.736) [HTTP is the protocol that lets me search for microwave ovens and buy one from Amazon.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=10.966) [It's also the protocol that lets me reunite with old friends on a Facebook chat](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=16.376) [or when there's nothing good on TV I can go to YouTube](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=20.526) [and watch videos of cats doing funny things.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=22.776) [All of these things happen on the web where HTTP defines what is possible.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=25.716) [It's a protocol that allows a web server from a data center in the United States](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=30.416) [to ship information to an Internet cafe in Australia](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=34.706) [where a student can read a web page describing the Ming Dynasty in China.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=37.686) [In this course, we'll look at HTTP from a software developer's perspective.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=42.086) [Having a solid understanding of HTTP can help you write better web applications](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=45.776) [and web services.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=50.256) [It can also help you debug applications and services when things go wrong.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=51.286) [We'll be covering all of the basics including resources, messages, connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=56.696) [and security as it relates to HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=60.276) [This module is going to focus on resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=0&mode=live&start=63.376)

[Uniform Resource Locators](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live)

[Perhaps the most familiar part of the web is the HTTP address.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=2.106) [When I want to find a recipe for a dish featuring broccoli, which is always never,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=6.506) [I might open my web browser and enter http://food.com in the address bar.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=11.036) [So I can go to food.com and search for recipes.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=18.316) [My web browser understands that syntax and it knows it needs](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=21.946) [to make an HTTP request to a server named food.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=25.586) [We'll talk later about what it means to make an HTTP request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=30.376) [and all the networking details involved.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=34.206) [For now I just want to focus on this address, http://www.food.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=36.316) [It's what we call a URL, Uniform Resource Locator.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=44.516) [It represents a specific resource on the web.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=48.346) [In this case, the URL locates a resource that is the home page of the food.com website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=51.456) [Resources are things I want to interact with on the web; images, pages, files and videos.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=58.156) [These are all resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=63.756) [There are billions if not trillions of places to go on the Internet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=65.666) [In other words, there are trillions of resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=69.356) [Each resource will have a URL I can use to find it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=72.236) [News.google.com is a different place than news.Yahoo.com; two different names,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=75.806) [two different companies, two different websites so, therefore, two different URLs](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=81.426) [because they're two different resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=85.736) [Of course you can have different resources and different URLs inside the same website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=87.936) [Food.com/recipes/broccolisalad is the URL for a page](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=93.806) [with a broccoli salad recipe while food.com/recipe/grilledcauifllower that's still](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=97.966) [at food.com but it's a different resource describing a different recipe.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=103.886) [We can break the URL for that last resource into three parts.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=107.996) [First there's the HTTP part, the part before the colon slash, slash.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=112.366) [It's what we call the URL scheme.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=116.886) [It describes how to access a particular resource and in this case it tells the browser](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=119.306) [to use the Hypertext Transfer Protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=124.286) [Again, we'll provide more low-level details on this protocol later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=127.466) [We'll also look at a different scheme HTTPs, which is the security HTTP protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=131.756) [You might run into other schemes on the Internet like ftp for the File Transfer Protocol and mail](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=137.706) [to for email addresses because URLs are used for other protocols besides just HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=143.666) [Everything after colon slash, slash will be specific to a particular scheme.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=149.726) [So, a legal HTTP URL may not be a legal mail to URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=155.856) [Those two really aren't interchangeable which makes sense](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=160.576) [because they describe different types of resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=163.216) [The first part after colon slash, slash is food.com and that is the host.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=166.496) [This part literally tells my browser which computer](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=171.956) [on the Internet is hosting the resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=174.586) [My computer will use the domain name system to look up an address for food.com,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=177.336) [turn that into a network address and then it will know exactly where to send a request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=182.556) [You can also specify that host portion using the IP address directly but most people want](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=187.426) [to use a friendly name like food.com instead of 204.78.50.82.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=192.356) [The last part of the URL is the URL path.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=197.926) [The food.com host should recognize what specific resources requested](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=202.346) [by this path and respond appropriately.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=206.426) [A path looks very hierarchical like a file system path and sometimes a URL will point](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=210.496) [to a real resource that is on the host's file system or hard drive.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=216.106) [For example, the URL food.com/logo.jpeg might point to a jpeg file that really does exist](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=220.696) [on the food.com server; however, resources can also be dynamic.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=228.026) [The URL food.com/recipes/broccoli probably doesn't refer](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=232.906) [to a real file on the food.com server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=238.036) [Instead, some sort of application is running on the food.com host that will take that request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=240.656) [and build a resource using content from a database.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=246.136) [The application might be built using asp.net, php, pearl, ruby on rails](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=249.516) [or some other web technology that knows how to respond to incoming requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=254.176) [by sending back HTML that a browser can display.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=258.746) [In fact, these days many websites try to avoid having any sort of real file name in the URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=261.526) [For starters file names are usually associated with a specific technology](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=268.206" \t "psplayer) [but many URLs will outlive their technology that is used to host and serve them.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=272.586) [Secondly, many sites want to place key words into a URL like having recipe and broccoli](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=277.006) [in the URL for a broccoli recipe resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=283.516) [Having those key words in the URLs is a form of search engine optimization](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=286.236) [that will rank the resource higher in search engine results.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=290.046) [Its descriptive key words not file names that are important for URLs these days.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=293.646) [Some resources will also lead the browser to download additional resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=300.386) [This food.com page will include images, JAVA script files, cascading style sheets](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=305.496) [and other resources that all combine together to present the recipe that we're viewing.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=310.336) [If you view the HTML source code to this page, you'll see script tags, image tags](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=315.046) [and style tags inside that will point to additional URLs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=320.026) [So in building one web page like that a browser will typically make multiple HTTP requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=323.746) [to retrieve all the resources needed for that one page to display properly in the browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=1&mode=live&start=329.476)

[HTTP and IIS](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live)

[Let's look at a quick demonstration with IIS just to make this a little more concrete.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=1.636) [IIS or Internet Information Services is the web server that can run on Windows machines.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=6.356) [What I have to open is the IAS manager which is showing me](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=12.376) [that there is a default website configured to run on this machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=15.536) [If I go into the basic settings for this, it will show me that it maps](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=19.396) [to the physical path C:/inetpub/wwwroot.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=24.586) [Now, IIS knows how to respond to incoming HTTP requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=28.676) [and one of the things it can do is actually look in this physical path to see](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=32.776) [if the resource exists on the file system that it can use to respond to an incoming request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=36.586) [So, inside of that physical path I have a folder called "test" and inside](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=42.046) [of that folder I have a file called "test.text" that just has plain text inside of it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=49.286) [So this is not paper text, this is not HTML, this is just a plain text file](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=56.306) [with the word hello in it and in order to reach it,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=61.766) [I'm going to have to craft a URL to reach that file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=64.766) [I know the scheme that I want is HTTP, I know the host that I want is going to be local hosts.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=68.226) [That's the machine that this is executing on.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=74.636) [So let me open up a web browser and go to http:localhost/test/test.text](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=80.476) [and that returns me the resource and displays the contents](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=91.876) [of that file which is just the string hello.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=97.966) [If I were to ask for something else like test.asp, IAS will come back](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=100.736) [and say sorry the resource that you're looking for has been removed or it's not there,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=106.316) [I cannot find it, but let's actually change that file into an asp file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=110.936) [So, if you're not familiar with asp, it was one of the early web technologies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=116.916) [that Microsoft released that allowed you to build dynamic web pages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=121.966) [So I'm going to rename test.text to test.asp and then we'll edit test.asp](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=126.796) [and do something very simple, which is to say response.rate and we'll still just say hello](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=135.396) [and that was the syntax you could use to write out strings or the results of calculations](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=144.066) [that you put together in an asp file and that's still not HTML;](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=150.966) [that's still just writing out the text hello.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=154.416) [If we wanted to really produce HTML, we'd need an HTML tag and a body tag](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=156.846) [and all of that stuff, but let's just see if our request works now](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=160.516) [after I make sure I save this file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=163.866) [We'll do a quick refresh and now we still get the hello.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=167.916) [So asp is just an example of a technology that you can use to dynamically build a response](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=170.666) [to an incoming HTTP request for URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=177.486) [We'll look at some more details of the interaction that just happened](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=179.926) [as we progress through this course.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=2&mode=live&start=185.256)

[Ports, Queries, and Fragments](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live)

[Now we know a little more about URLs or URLs as some people call them and we know](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=1.786) [that a URL consists of a scheme, a host and a URL path but there's an additional piece](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=7.296) [of information in this URL, the colon 80 and the number 80 represents the port number](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=12.826) [that the host is going to use to listen for HTTP requests.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=18.886) [The default port number for HTTP is port 80.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=22.976) [So you generally see this port number omitted from an URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=27.066) [I would not need to use colon 80 to reach any web server that's listening on the default port](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=30.916) [because the browser will just assume you mean port 80 unless something else is specified.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=36.506) [If, however, I went into IAS, which also listens to port 80 by default](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=42.206) [and I configured it to listen on port 8,080, then I would need to put that port number](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=46.356) [in the URL in order to reach that test.asp resource](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=52.066) [that we were experimenting with earlier.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=56.786) [So you only need to specify the port number if the server is listening when a port other](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=59.396) [than the default port, port 80, and that usually only happens in testing,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=63.026) [debugging and development environments](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=68.246) [because most commercial websites don't want a port number in their URL, it just makes the URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=70.566) [that much harder to remember and it makes the URL a little bit longer.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=75.206) [Let's look at another URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=79.296) [This one still has a scheme and a host and URL path, of course,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=81.916) [but it has another optional piece on the end which is known as the query.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=85.666) [Everything after the question mark is the query or query string some people will call it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=89.206) [The query string will contain information for the website that it can take and it has](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=94.136) [to interpret to figure out what resource you want.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=98.266) [There's actually no formal standard for how this query string should look.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=101.016) [It's technically up to the application to interpret whatever it finds there](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=104.736) [but you'll see the majority of query strings in use are used to pass mean value pairs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=108.626) [So, for example, the query string in this particular URL has two parameters.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=114.646) [The first one has the name first name with the value Scott,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=120.736) [the second one has the name last name with the value Allen and so if we go back to the bing URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=124.206) [at the top, the bing search engine will see the name Q and it turns](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=132.376) [out that is the query string parameter that it looks for to figure out what you're trying](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=136.496) [to search for and we can think of that URL as the URL for the resource](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=141.026) [that represents the bing search results for a particular type of tree](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=146.586) [that happens to grow in Southeastern Brazil.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=151.466) [Finally, one more URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=158.136) [This particular URL, again, still has a scheme, still has a host, those are required,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=160.466) [and has a URL path and then it also has this piece](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=164.946) [at the end while along the hash sign it is known as the fragment.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=167.776) [The fragment is different than the other pieces we've looked at so far because unlike the path](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=171.886) [in the query string the fragment is not processed by the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=176.146) [The fragment is only used on the client and it identifies a particular section of a resource](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=180.006) [that the client should navigate to or focus on.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=186.086) [Web browsers will typical align the initial display of a web page](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=189.256) [such that the element identified in the fragment will be at the top of the screen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=193.076) [Let me show you an example.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=197.896) [We will actually open up the Wikipedia article for the Brazilian grape tree,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=200.806) [and we'll see that there's a table of contents here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=205.216) [Notice that the URL at this point does not have a fragment inside of it,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=207.726) [but if I click on cultural aspects all I'm really doing is navigating within that resource,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=212.066) [this single particular article and I can even take that link and hand it to someone else](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=217.476) [and if they follow that link they, too, will be taken to that particular spot](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=224.016) [so that this particular section of the resource appears on the page instead of starting](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=230.236) [at the very top of the page and if we look at the source code to this or inspect the element,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=234.406) [we would indeed see that the ID of this dom element that's in the browser matches the text](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=244.356) [that is in the fragment of the URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=249.796) [So fragments have nothing to do with reaching the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=252.696) [or how the server interprets particular URL; they're strictly used on the client side,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=257.166) [but you will see them in URLs so I wanted to point them out.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=262.526) [If you've been following along so far, then you'd be able to look at this URL and know](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=265.996) [that it has a scheme, which is HTTP, and that's required; a host name called host,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=270.406) [that's also required; a port of 8,080; a URL path called path; a query string,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=275.786) [q equals query; and finally a fragment.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=3&mode=live&start=282.546)

[Query Strings and ASP](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live)

[I wanted to do a quick demonstration of reading the query string from an active server page just](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=1.476) [so you can get a feel of what this would look like from a web programming perspective.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=7.236) [Here I had the browser pointed to the test.asp file that we were working with earlier](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=11.356) [and right now it's passing in a query string that says name equals Scott.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=16.076) [So how could I take that query string and print out a message here inside](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=20.266) [of the HTML that would say hello, Scott?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=24.136) [With an asp the first thing I might do is declare a variable called name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=27.606) [and use that to hold the value that I get from asking for query string sub name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=31.736) [Basically on active server pages you could have it parse out the value](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=42.406) [of a particular query string variable that you give it and we'll just write that like this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=45.786) [Declare it then assign it and then declare a message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=52.426) [We'll say that the message is equal to hello comma and then we'll add on the name value,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=58.026) [but before I do that I'm going to make sure I HTML encode that value just](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=65.316) [in case some malicious user comes to this page and puts JAVA script in the query string trying](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=71.436) [to get that to show up on the page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=76.746) [HTML encode will make sure that that shows up just as text on the page and here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=79.256) [in the div I can now put the message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=83.786) [So, I'll save that file, refresh the browser and that works.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=4&mode=live&start=88.046)

[URL Encoding](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live)

[All software developers who work with the web should be aware](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=1.986) [of character and coding issues with URLs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=4.516) [The official standards describing URLs go to great lengths to make sure URLs are](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=7.466) [as useable and interoperable as possible.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=12.276) [A URL should be as easy to communicate through email as it is to put on a billboard](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=15.516) [or a bumper sticker or a business card.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=20.376) [For this reason, the standards to find unsafe characters for URLs](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=23.146) [and unsafe character is a character that should not appear in an URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=27.616) [For example, the space character is considered unsafe because spaces are hard to read.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=31.006) [They can mistakenly appear/disappear when a URL is in printed form.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=37.386) [Other unsafe characters include the pound sign because it's used to delimit a fragment.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=42.806) [That doesn't mean that you cannot use a pound sign in a URL;](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=47.096) [it just means that the pound sign can only be used](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=50.756) [in its reserved position which is to delimit a fragment.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=53.296) [Another unsafe character is the caret](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=57.836) [because it isn't always transmitted correctly through the network.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=59.756) [RFC 3986, which is the Internet standard or the law for URLs, defines the safe characters](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=63.606) [as basically being the printable US ASCII characters.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=70.966) [The lower case alphabet, the upper case alphabet, the digits](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=75.506) [and then just a few special characters like dollar sign, underscore,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=79.416) [asterisk, the parentheses and a comma.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=83.396) [Unfortunately, you can still transmit unsafe characters in a URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=86.616) [but they need to be percent encoded or URL encoded;](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=91.286) [two different terms but it's the same outcome.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=94.976) [Percent encoding is the process of taking a character like the space character and a URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=98.416) [and replacing it with a percent 20; 20 is the hexadecimal value for the space character](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=103.936) [in the US ASCII character set and so a percent encoding is basically taking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=110.466) [that hexadecimal value, putting a percent in front and then replacing a character](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=115.806) [in the URL with that percent encoded value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=120.756) [As an example, if you really did want to have Scott\_Allen in a URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=123.366) [it would need to be encoded so that it would come out to be Scott&20Allen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=128.686) [Almost every web application framework will make this really easy.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=134.006) [They all have APIs for URL encoding.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=137.156) [On the service side, you should run dynamically created URLs through the encoding algorithm just](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=140.156) [in case one of the unsafe characters will appear in the URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=5&mode=live&start=145.996)

[Content Types](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live)

[So far we've focused on URLs and simplified everything else, but what does it really mean](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=1.946) [when we enter a URL into the browser?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=6.796) [Typically it means we want to retrieve or view some resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=9.806) [There's a tremendous amount of materials to view on the web](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=14.116) [and also we'll later see how HTTP enables us to create, delete and update resources](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=16.656) [but for now we're going to stay focused on retrieval.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=23.146) [We haven't been very specific about the types of resources that we want to retrieve.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=26.156) [There are thousands of different resources on the web.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=31.856) [There are images, there are hypertext documents, xml documents, video files, audio files,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=34.216) [executable applications, PDF documents and Word documents.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=39.226) [In order for a host to properly serve a resource and in order for the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=43.816) [to properly display a resource, the parties involved have to be very specific](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=48.986) [and precise about the type of resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=53.586) [Is the resource an image or a movie?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=56.196) [We wouldn't want our web browsers to try and render a JPEG image as text](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=58.726) [and we wouldn't want them to take text and try to interpret it as an image.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=63.566) [So when a host responds to an HTTP request, it returns a resource](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=67.606) [and also specifies the content type.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=72.256) [This is also known as the media type of the resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=75.636) [We'll see the details of how this appears in an HTTP message in the next module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=78.776) [The content type that a server will specify rely](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=84.556) [on the Multi-purpose Internet Mail Extensions or MIME standards.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=87.346) [Although MIME was originally designed for email communications it worked so well](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=92.576) [that HTTP uses these standards for the same purpose, which is to label the content in a way](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=96.546) [that the client will know what the content is.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=101.906) [So, when the client requests an HTML web page, the host can respond to the request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=104.976) [with some HTML that it labels as text/html.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=110.106) [Text is the primary media type; HTML is the sub type.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=115.176) [When responding to a request for an image, the host can label the resource with a content type](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=119.726) [of image/jpeg or /gif or /png for png files.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=124.476) [Those content types are standard MIME types and are literally what will appear,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=130.486) [that text will appear in the HTTP response and location where the client can parse it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=135.526) [So for a long time I used to believe that a browser determined the type](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=141.336) [of content it was receiving just by looking at the file extension in the URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=145.096) [but it turns out it doesn't work that way at all.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=151.036) [In fact for many browsers, the file extension is the last place the browser will go](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=153.376) [to determine the content type that it's receiving.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=158.126) [The first place it will go is the MIME type that the server returns.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=161.726) [To demonstrate that real quick let's go back into Internet Information Services.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=165.676) [Inside of the IAS manager for any given website I can go in](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=171.166) [and configure the MIME types that IAS will use.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=175.146) [The MIME types literally are the content types or the MIME types that it will return](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=178.806) [when it's serving up a file from the file system.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=183.636) [You can see there's quite a few MIME types that are registered in here including .PDF,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=185.986) [which has a MIME type of application/PDF.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=195.156) [That should tell the client that what it's receiving is a PDF file](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=198.986) [and that's how it should interpret the content.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=202.516) [It just so happens that in the directory, the test directory that we were using earlier,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=205.196) [I've put a file in here slides.PDF.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=210.836) [So it's a static file and I'd like to be able to open a browser and just be able](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=212.476) [to request logohost/test/slides/pdf and have that display in the browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=218.256) [You can see that that is working quite well, but let's do a couple of experiments.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=224.076) [First, let me come in and rename slides.PDF to be slides.foo.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=228.526) [Just some arbitrary extension and I'll come in and try to request slides.foo](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=235.986) [and IAS will refuse to serve this file because it doesn't know what the MIME type is.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=242.296) [We need to put an entry into that MIME type configuration to say .foo should map too](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=249.116) [and in this case it could be application/pdf, but now let's go back and see what happens](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=255.496) [if we do something wrong so I'll rename slides.foo back to slides.pdf](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=261.626) [and if I request slides.pdf everything is working again and now to prove](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=268.836) [that the browser is relying on this content type to figure out what the content is, let's go in](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=277.596) [and edit this MIME type and say that when you serve](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=281.816) [up a PDF file the MIME type should be text/html.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=285.546) [So the browser is going to be told](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=291.276) [that what it's receiving is HTML even though there's a .pdf in the URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=292.716) [So let me do a hard refresh and now what we're seeing is that the browser is trying](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=299.066) [to display the contents of that PDF file as HTML and it's not working out so well.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=305.776) [So, having incorrect or missing MIME types mapped in your server configuration](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=310.916) [and this is true for IAS, it's true for Apache, it's true for nearly every web server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=317.816) [it can cause problems in your website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=321.966) [For instance, one case I ran across recently was video files not being served](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=325.276) [because the correct MIME types were not registered on a server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=6&mode=live&start=329.566)

[Content Negotiation](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live)

[Although we tend to think of HTTP as something that's used to serve up web pages and images,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=1.956) [it turns out the HTTP specification describes a very generic protocol](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=7.146) [for moving information around in an interoperable way.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=12.076) [Part of the job of moving information around is making sure everyone knows how](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=15.706) [to interpret the information and that's why those content type settings](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=19.476) [and MIME mappings they're so important to the web, but media types aren't just for hosts.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=23.576) [Clients can also play a role in what media type a host returns](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=29.386) [by taking part in a content type negotiation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=33.476) [A resource that's identified by a single URL can have multiple representations.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=37.376) [Take, for example, the broccoli recipe that we were looking at earlier.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=43.706) [A single recipe might have representations in different languages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=47.796) [like English versus French versus German.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=51.626) [It could also have representations that differ by format HTML](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=54.596) [versus PDF versus plain text versus xml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=58.786) [It's all the same resource and the same recipe just different representations.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=62.246) [The question that comes to mind then is which representations should the server use](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=67.216) [and the answer to that is in the content negotiation mechanism described](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=72.946) [by the HTTP specification.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=77.226) [So when a client makes an HTTP request to a server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=79.636) [the client can specify the media types that it will accept.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=83.666) [Media types then are not only for the host to use to tag outgoing resources](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=88.406) [but they're also available for clients to specify the media that they want to consume.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=93.616) [The client specifies what it will accept in the outgoing request message and, again,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=98.786) [we'll see the details of that message in the next module, but imagine this request going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=102.876) [out to the food server saying I want HTML and, oh, by the way, I also want this in French.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=108.016) [Now it could turn out that the server doesn't have HTML for that recipe available.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=114.646) [It only has a PDF and it will send that back or it could turn out that it does have HTML](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=119.096) [but only an English version and that might disappoint the user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=124.186) [but that's why we call it content negotiation and it's not an ultimatum.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=127.746) [We can actually see content negotiation at work with languages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=132.196) [For instance, if I go to google.com with my default configuration,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=137.426) [everything is showing up in English.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=141.556) [I have the Google search button and the I'm feeling lucky button,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=143.376) [but now let me go into my Internet options and change the languages and move French to the top](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=147.106) [of this language preference list.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=152.866) [These languages that I want actually go out to the server and by putting French first](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=155.296) [on top I'm advertising to the server that I prefer resources to be in French where possible.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=160.146) [After doing that if I refresh, you'll notice most of the text](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=166.166) [on the page here has changed over to French text.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=170.216) [If I go back into Internet options, I move English up the server is going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=172.956) [to respect this again and put everything into English.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=180.946) [So, web browsers are pretty sophisticated pieces of software and they can deal](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=185.546) [with many different types of resource representations.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=189.156) [This content negotiation is something a user would probably never care about except](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=192.636) [for purchase the language settings but for software developers, you and me,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=197.496) [especially people who develop HTTP web services content negotiation is part](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=201.896) [of what makes HTTP great.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=207.716) [A piece of code written in JAVA script can make a request to the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=210.056) [and ask for a JSON representation because that's easy to parse in JAVA script.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=213.276) [Meanwhile, a piece of code written in C++ can make a request to the same server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=218.556) [to the same URL and ask for an XML representation of a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=222.466) [In both cases if the host can satisfy that request, the information arrives at the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=227.426) [in an ideal format for parsing and consumption.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=7&mode=live&start=232.566)

[Conclusion](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live)

[In this module, we learned that the web and HTTP are both all about resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=2.126) [We have URLs to locate those resources and MIME type](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=7.536) [to specify the representation of those resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=10.986) [All of this was designed to just make things work.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=14.476) [So a Linux server can communicate with a PC client and vice versa.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=17.666) [At this point, we've gotten about as far as we can go without getting](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=21.826) [into the nitty gritty details of what an HTTP message looks like.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=25.476) [You're probably already wondering what these content type specifications look](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=29.836) [like when they go across the network wire.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=33.626) [We'll dig into those details in the next module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m1-resources&clip=8&mode=live&start=36.396)

[HTTP Messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live)

[Hi, this is Scott Allen, and in this module we're going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=2.096) [to look inside the messages exchanged in an HTTP transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=5.016) [We're going to learn about methods, message types, HTTP headers, and status codes.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=9.366) [Understanding these concepts is important for developers who work on the Web.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=13.686) [Not only will you be able to build better applications by responding with the right types](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=18.986) [of messages, but you're also going to be able to spot problems and debug issues,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=23.126) [when Web applications aren't working.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=0&mode=live&start=27.486)

[Message Types](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live)

[Imagine walking up to someone in an airport and asking, Do you know what time it is?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=2.166) [In order for that person to respond with the correct time, a few things have to be in place.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=7.266) [First, the person you've asked has to understand your question,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=12.326) [because if they don't know English, they might not be able to make any response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=15.846) [Secondly, the person you've asked will need access to a watch](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=19.596) [or some sort of timekeeping device.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=23.196) [This airport analogy is similar to how HTTP works.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=25.946) [You're the client, and you need a resource from some other party,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=29.516) [the resource being information about the time of day.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=33.116) [So you make a request to the other party, using a language and vocabulary](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=36.386) [that you understand and you hope they will, too.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=40.256) [If the other party does understand your request and has the resource available, they can reply.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=43.516) [If they don't understand the request, then you might not get any response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=49.056) [The HTTP specification -- specifically, the HTTP/1.1 specification --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=53.896) [it defines the language, so that everyone on the Web --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=59.756) [all the clients and all the servers -- they can understand each other.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=62.926) [It defines the messages being exchanged on the Web](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=66.716) [and what they should look like and what they contain.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=69.636) [And it turns out there's two types of messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=71.836) [HTTP is a request and response protocol, so the first type of message is the HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=74.996) [That's what the client sends to the server, and they carefully format that message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=81.956) [so that the server will understand it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=86.376) [A server responds by using a different type of message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=88.576) [the second type of message, which is an HTTP response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=91.416) [And again, that message will be formatted so that the client will understand.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=95.096) [It's formatted according to the HTTP/1.1 specification.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=99.706) [The request and the response are two different message types,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=104.246) [but they get exchanged inside of a single HTTP transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=107.356) [The standards define what goes into those messages,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=111.516) [so that everyone who speaks HTTP will understand each other and be able to exchange resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=114.836) [Or, when the resource doesn't exist, the HTTP response can contain an error message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=121.056) [that the client will understand that that resource didn't exist.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=1&mode=live&start=126.476)

[A Manual Request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live)

[A Web browser knows how to send an HTTP request by opening a network connection to a server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=1.356) [or machine and sending out that request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=6.426) [For instance, if I come into a browser and ask to go to www.odetocode.com and pull](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=9.736) [down an image, odetocode.JPEG, the browser sends off that request and displays the JPEG.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=16.826) [Notice one thing that happened here is the URL changed from www](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=24.026) [to just odetocode.com/odetocode.jpg.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=27.356) [Now there's nothing magical about this request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=32.756) [It's just a command in plain ASCII text, and it's formatted to the HTTP specification.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=36.456) [And any application that can send data over the network --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=41.716) [pretty much any of those applications can make an HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=45.086) [You can even make a request manually, using an application like Telnet, from the command line.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=48.226) [Now, Telnet has been around for decades.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=53.636) [It's a very old application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=55.736) [And what we can try to do is Telnet to odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=57.856) [The problem is that Telnet, by default, tries to use port 23,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=62.106) [and there's nothing listening on port 23 on odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=67.526) [And we learned in the first module of this course that the default HTTP port is port 80.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=71.726) [So that connection didn't work.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=78.016) [Fortunately, you can pass a port number to Telnet and tell it to connect](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=80.126) [to port 80, and now we are connected.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=84.816) [Let's see if the server understands plain text messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=88.236) [So I'll type out: Can I have odetocode.jpg?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=92.076) [And I get a response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=96.636) [The response is telling me that I made a bad request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=102.036) [Essentially, it didn't understand the natural English that I typed in here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=106.276) [Didn't send a proper HTTP request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=109.906) [It wasn't formatted according to the specification.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=113.246) [Fortunately for us, I know how to make a proper HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=116.896) [So let me connect again to odetocode.com, port 80.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=121.116) [And this time I'm going to enter an HTTP message, a proper message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=124.336) [So first I'm going to type what I want to do, which is get; and the resource I want to get,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=128.796) [which is odetocode.jpg; and the protocol that I'm using, which is HTTP/1.1.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=133.746) [On the next line, I need to type some additional information that is required](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=142.276) [in every HTTP message, and that is the host that I'm trying](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=146.246) [to connect to, which is www.odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=150.806) [This host information is required, and it's because a server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=154.406) [like this can support multiple websites.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=158.146) [This server could support odetocode.com and odetofood.com and www.odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=160.676) [They could all be different websites.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=168.256) [Obviously, odetocode and odetofood would be two different websites.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=170.186) [And the server doesn't really know that I'm trying to connect to odetocode.com,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=173.466) [even though I typed that into the command window.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=177.196) [That has to be in the message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=179.076) [It has to parse that out and figure out where to send this message, which site.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=180.626) [So with all that in place, I can press the Enter key twice,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=184.546) [and this time we get back a different response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=188.506) [Now, we will be breaking down the pieces of this request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=193.426) [and response, as we move through this module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=196.076) [But let me give you the high-level details of what this response is telling me.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=198.346) [It's telling me that the resource I want exists --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=202.246) [this JPEG image -- but it's moved somewhere else.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=207.076) [It's moved permanently to another location.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=210.126) [And the response says that that resource is now at odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=212.436) [Not www.odetocode.com, just odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=216.956) [So if I'm implementing a Web browser, it's up to me to parse that response,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=222.326) [realize that I've been redirected -- that something has moved,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=226.436) [and then issue another request to that proper location that's specified in the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=230.036) [These types of redirects are common, and the reason is to make sure that all requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=236.376) [for a particular resource go through a single URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=241.146) [In other words, we don't want content coming from www.odetocode.com and just odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=245.446) [We want everything to go through odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=252.296) [This is a search engine optimization technique known as URL canonicalization.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=255.246) [Now that I know the resource has moved to a different location, let's try this once again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=264.236) [I'm going to Telnet to www.odetocode.com, port 80, just to prove that the host name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=268.516) [that I'm using to connect and the host that I specify](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=275.756) [in the HTTP message really are two different things.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=278.766) [This piece that I'm typing into the Telnet command just gets looked up as an IP address,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=282.066) [and all the server knows is that we're trying to connect to it on this port.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=287.466) [So now let's try to get odetocode.jpg, using the HTTP/1.1 protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=291.466) [Host, now, is just odetocode.com, not www.odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=299.416) [And I'll submit that request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=304.676) [And what we get back is a bunch of binary data that represents the JPEG.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=306.476) [And if I scroll up, we will see that that content -- that JPEG image --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=311.446) [was part of the HTTP response message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=318.136) [The response message tells us that the request went okay;](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=321.596) [that the content that is being returned --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=325.066) [remember the mime types that we talked about in the first module --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=328.066) [the content type is image/JPEG; and then there's some additional information in this response,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=331.316) [some additional headers that specify things like when this particular resource was last modified,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=337.476) [that allows the client to do some caching -- we'll talk about that more --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=343.316) [and things like the content length and the date.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=346.526) [This is just information --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=350.286) [additional information that the client can use, about the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=351.816) [And so, what we've done here in the Telnet window --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=355.836) [which is issue a request for that JPEG, get redirected, resend the request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=358.716) [to a different host and actually pull down the data --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=364.276) [that's exactly what happened here in the browser window, when we initially went](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=367.456) [to www.odetocode.com for this image.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=370.926) [And the browser saw that redirect, reissued the request to odetocode.com, and it lets us know](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=374.076) [that it did that, by putting the new URL to the resource here in the address bar.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=2&mode=live&start=382.626)

[HTTP Methods](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live)

[Let's talk about the request that I sent to the server in that last clip.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=1.786) [The first word that I typed into the Telnet session was get,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=6.396) [and get is one of the primary HTTP methods.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=9.746) [Every request message has to include one of the available HTTP methods.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=13.776) [And the method tells the server what the request wants to do.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=18.546) [So get wants to do what it sounds like it wants to do, it wants to get,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=22.046) [or in fact, to retrieve a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=25.816) [I can get an image or get a PDF file, an HTML page,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=28.086) [or any other resource that the server might hold.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=32.396) [Some of the common HTTP methods are shown in this table here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=35.266) [We have get, to retrieve a resource; post, to update a resource; put,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=39.256) [to store or add a resource; and then there's delete, to remove a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=44.486) [There's also a head method, which is asking the server just](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=49.386) [for the headers that describe a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=52.546) [We'll talk more about headers later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=55.126) [Now, of these five methods, just the first two are the primary workhorses](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=57.406) [of the Web, get and post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=62.426) [So even though the HTTP specification lists a number of legal methods --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=64.366) [even more than what we see here -- it turns](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=68.506) [out that the HTML specifications only use get and post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=71.246) [So put and delete are almost never used in Web applications.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=75.966) [Now, if you're writing an HTTP Web service, you might want to use these other methods to add](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=80.156) [and delete resources, but you'll have to be careful,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=84.546) [because there are even some server-side technologies and pieces of hardware](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=87.536) [on the network that will not process put and delete messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=91.806) [So primarily, what you use to get work done with HTTP is get and post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=96.136) [A Web browser issues a get request when it wants to retrieve a resource, like a page,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=101.486) [an image, a video, or a document.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=105.396) [And a get request is probably the most common type of request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=107.316) [It's basically used to read data.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=111.256) [A Web browser sends a post request, when it has data it wants to send](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=113.746) [to the server, perhaps for an update scenario.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=117.686) [For example, if I go to Amazon.com and click Add to Cart, that's going to issue a post request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=120.576) [to Amazon, to describe what I want to purchase.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=126.996) [Post requests are typically generated by a form element on a web page,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=130.156) [like the form that you fill out with input elements](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=134.546) [for address and credit card information.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=136.936) [I'll show you some specific scenarios with form tags,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=140.016) [but first we have to really understand the primary difference between get and post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=3&mode=live&start=143.126)

[Safe Methods](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live)

[There is a part of the HTTP specification that talks about safe HTTP methods.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=2.086) [Safe methods are methods that you read and view resources from a Web server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=7.946) [Unsafe methods are methods that let you change resources on a Web server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=13.116) [The get method is one of the safe methods, since it should only retrieve a resource](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=18.066) [and not alter the state of that resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=22.186) [So sending a get request for a JPEG image doesn't change the image.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=24.626) [It just fetches the image for display.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=28.766) [We say that a get operation on the Web should never have a side effect on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=31.406) [Contrast that with an HTTP post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=36.286) [This is not a safe method.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=39.626) [It typically changes something on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=40.916) [Post is what we use to process a credit card transaction, update an account, submit an order,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=43.686) [or perform some other operation that may be destructive or constructive.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=49.326) [For this reason, Web browsers typically treat get and post differently,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=54.056) [since get is safe and post is unsafe.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=58.376) [Let me demonstrate the difference in a Web browser, and then we'll dig into some code.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=61.896) [When I go into the Web browser and tell it to request signup.cshtml, it issues a get request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=66.156) [to the server, brings back some HTML and displays this form](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=72.686) [that might be a sign-up form to create an account.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=76.156) [And I can refresh this page as many times as I want.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=79.266) [It's okay to repeatedly send a get request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=83.296) [It's not going to change anything.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=86.156) [However, once I fill this form out and I submit it, that has to be a post operation,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=89.026) [and what the browser is showing me now is the return message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=95.026) [that included some HTML from that post operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=99.816) [And now, if I try to refresh, I'll get a warning.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=102.796) [The browser knows I just performed an unsafe operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=107.416) [I'm trying to refresh it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=110.406) [And that might cause me to submit a duplicate credit card transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=111.606) [It might try to create two accounts, instead of one account.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=116.266) [There are many scenarios where undesirable things will happen,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=119.466) [if I click that Continue button to resubmit that post operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=123.676) [Let's look at some code and see if we can improve this scenario.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=4&mode=live&start=127.586)

[GET and POST Scenarios](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live)

[Let's start off with a very simple scenario.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=1.396) [Here I have an ASP.NET Web page, written using the Razor syntax, that is just going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=3.976) [to display a link to a sign-up page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=9.236) [And when I run this in the browser and the browser sees that URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=11.746) [it has to issue a get request to pull down the HTML.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=16.116) [And since that's a safe operation, I can click Refresh as many times as I want.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=19.136) [And even when I follow that link, the browser gets presented with a new URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=23.776) [and now I have a form that I can fill out.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=28.706) [But once I click the Submit button, that's going to be a post operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=31.696) [So here, in signup.cshtml, we have inputs,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=36.586) [where a user can enter the first name and their last name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=40.156) [These are inside of a form.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=43.366) [Method equals post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=44.886) [That's going to allow the browser to collect those inputs together and post them](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=46.106) [as name value pairs inside the body of the HTTP message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=51.116) [And we'll take a look at exactly what that message looks like in a bit.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=54.696) [But for now, just concentrate on the fact that this is a post operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=58.876) [We're going to post back to the same URL that this came from, so post back to signup.cshtml,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=62.796) [which, when it detects that there's a post back,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=69.586) [it's going to read those values out, redisplay itself to the user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=72.476) [And it's going to write out the first name and the last name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=76.236) [that get posted to it in the form collection.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=79.496) [Now, since that's a post operation, and the browser knows that that is not a safe operation,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=82.926) [clicking Refresh at this point brings up that warning -- Are you sure you want to do this?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=88.816) [-- because you might duplicate something.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=92.926) [You might put two charges on your credit card instead of one.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=95.246) [How can you fix a problem like this?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=98.556) [Well, one solution would be, if there is a post back, let's not try to figure out how](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=101.396) [to redisplay this page to the user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=108.156) [Instead, let's save off the values that the user has entered, put them in the database.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=110.686) [In this case, I'm just going to put them in a couple server-side session variables,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=115.296) [and those are implemented with HTTP cookies, which we'll take a look at in a later module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=119.546) [But for now, just know that the first name and the last name are saved off in the server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=124.716) [in a place where I can get them, after we do a response.redirect, and redirect the browser](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=129.556) [to a different page, signedup.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=136.146) [So now, when I save this, it will come out and we'll go back](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=139.386) [and issue the initial get request for this page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=145.216) [Now, when I submit this page, then we should come into here, save the values,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=148.506) [and immediately redirect the browser to signedup.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=154.506) [And when you do a response.redirect, the browser has to issue a get request for that URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=158.956) [So now I'm signed up, and I'm also sitting on a page that is the result of a get operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=165.816) [So I can refresh everything again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=171.466) [This post and redirect to a get is a fairly common pattern these days on the Web.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=173.946) [It's called post-redirect-get -- or PRG for short --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=180.306) [and it's a pattern that you specifically implement, to avoid that warning,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=183.496) [if the user tries to refresh the result of a post operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=188.126) [In this case, what we did was send the user over to signedup.cshtml, which is just going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=192.466) [to retrieve the values for first name and last name from the database, or from a Web service,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=197.996) [or in this case from a session object, and display that on the screen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=202.846) [Now, one thing I want to point out is that not every form requires method equals post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=206.476) [When you use method equals post, the values that are inside](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=213.406) [of here get tunneled into the HTTP message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=217.166) [But you can also have a form, method equals get,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=220.746) [and there's a significant difference between the two.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=224.036) [So here is a search form.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=227.736) [This has a form with a method equals get.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=229.196) [It has an input, where the user can type what they're searching for.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=231.896) [But when they click the Submit button, what the browser's going to do is issue a get request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=235.806) [to the URL specified by this action attribute, which is results.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=242.186) [And instead of taking any inputs that I have inside of this form and putting them](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=247.266) [into the message body, it's going to put them into the URL, into the query string instead.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=252.766) [So let's try that out.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=258.786) [Let me go to search.cshtml, and let's do a search for food.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=260.186) [And when I click Submit, results.cshtml knows I am searching for food.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=267.496) [How does it know that?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=273.126) [Because this get request forced the browser to issue a get request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=274.396) [and put the input into the query string.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=277.946) [So the results.cshtml?Q=food, the Q comes from the name of this input.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=280.756) [And then, all results.cshtml has to do is look at request.query string,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=288.516) [to figure out what the user is searching for.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=295.026) [What are the significant differences here?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=297.476) [Well, I just submitted a form, but created a get request,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=299.706) [and I can refresh this as many times as I want.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=304.106) [I can even take this URL, paste it into an e-mail or to a document and give it](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=306.426) [to someone else, so they can click on it and issue a get request to see these search results.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=313.766) [That's significantly different than post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=318.496) [In a post operation, the inputs don't go into the URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=321.376) [Again, they go into the HTTP message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=324.766) [Searching is inherently a safe operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=327.346) [I'm really just viewing search results.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=330.486) [Creating an account is not a safe operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=333.076) [I want to have a form with a method equals post, to perform that create operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=336.296) [Again, we'll come back a little bit later, once we've learned a few more things](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=342.126) [about HTTP messages, and figure out exactly what this request looks like with a post operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=5&mode=live&start=345.236)

[Request Messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live)

[So far, we've seen a raw HTTP request and we talked](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=1.586) [about two popular HTTP methods, get and post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=4.566) [But as this Telnet session demonstrated,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=7.736) [there's more to an HTTP request message than just the HTTP method.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=10.346) [A full request message will consist of the following parts: There's the method;](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=14.856) [and then the URL; and finally, the version.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=18.436) [This message is always in ASCII text, by the way,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=21.576) [and this first line is what we call the start line.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=24.506) [The HTTP version that you'll see in the start line is typically going to be 1.1,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=27.676) [because that's the standard that's been around since 1999.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=31.556) [After the start line, there can be one or more headers,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=34.716) [and then there can be a body to the HTTP message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=38.216) [For get requests, you typically don't see a body.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=41.246) [You just see the start line and then one or more headers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=44.366) [And I keep saying one or more, because, remember, the host header is a required header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=47.226) [Headers generally contain useful information that can help a server process a request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=52.106) [For example, in Part 1, we talked about resource representations and how the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=57.766) [and server can negotiate on the best representation of a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=62.296) [That's what we called content negotiation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=66.556) [If the client wants to see a resource in French, for example,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=69.346) [this is where it will include a header entry](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=73.136) [that says the language I want to accept is French.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=75.126) [Then there are numerous other headers that are defined by the HTTP specifications.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=79.026) [Some of the headers are general headers that can appear in a request or a response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=84.086) [One example of that is the date header that you see here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=88.836) [And that allows the client or the server to include a header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=91.646) [that indicates when it created this message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=95.546) [Now, everything but the host header is optional.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=98.676) [But when a header does appear, it has to obey the standards.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=100.866) [So the HTTP specification points to another standard](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=104.356) [that describes the standard format for dates.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=107.226) [Here are some of the other popular request headers](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=111.596) [that you might see on an outgoing request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=114.166) [One is the Referer header -- and yes, it's misspelled in the standard.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=116.726) [The Referer will contain the URL of the referring page, so when the user clicks](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=121.636) [on a link, the client can send the URL of the page that referred the user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=125.326) [to the resource that it's getting.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=130.296) [With the Web browsers, there's typically also a user agent header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=132.306) [that describes what user agent is making this request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=135.476) [On the server, you can parse that user agent and figure](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=138.946) [out if the user is using Internet Explorer 6 or Chrome or Firefox.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=141.456) [There's an Accept header that describes the media types that the user agent will accept,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=146.356) [and the Accept Language that describes the preferred language.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=151.076) [You'll also see Cookie headers in an HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=154.966) [We'll talk about cookies in a later module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=157.676) [And then, If-Modified-Since is one of these headers that you'll commonly see.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=159.786) [The If-Modified-Since header tells the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=164.996) [when the user agent last retrieved this resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=167.186) [And so, if the resource hasn't changed, the server does not have](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=171.186) [to send the entire resource back to the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=174.686) [It can just tell it, yes, you have the most recent version.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=176.826) [If-Modified-Since is quite commonly used to retrieve images,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=180.246) [because the browser can aggressively cache images and improve performance,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=184.206) [by not retrieving an entire image, if it already has a copy in the local file system.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=188.356) [So when you put all these together, a full HTTP request message might look like this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=192.456) [We're going to get the root resource, using HTTP/1.1.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=199.896) [We'll have a Host header, because that's required.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=203.466) [We want the connection to stay alive.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=206.556) [We'll talk about that in the next module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=208.326) [Here's the user agent header that says this is essentially Chrome, version 16.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=210.906) [Chrome will happily accept HTML text, also XHTML.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=215.236) [At the very end of that Accept header we're basically saying, give me anything that you have](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=220.636) [and I'll try to figure out what it is.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=225.426) [There is a Refer, so we landed on this page as the result of a Google search.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=227.706) [And then there's some more Accept headers that describe the preferred language,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=232.086) [the preferred character set, and the encoding that Chrome understands.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=236.616) [So since it understands gzip, the server can compress certain resources,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=240.926) [to send them down to the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=245.616) [Notice that some of these headers can contain multiple values,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=246.846) [so the Accept header says text/HTML comma, some other mime type comma, some other mime type.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=250.336) [And you'll also notice this Q value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=257.046) [The Q value is always a number from zero to one, and it represents the relative quality value,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=259.946) [or what the specification calls the relative degree of preference.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=265.226) [So something with a Q value of 0.9 is just slightly more preferred than something](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=269.516) [with a Q value of 0.8, but far more preferred than something that has a Q value of 0.3.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=6&mode=live&start=275.056)

[Response Messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live)

[After the request, you should receive a response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=1.776) [And a response message is similar to a request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=4.686) [It has a start line that includes a version -- that comes first here in the response, though.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=8.216) [Then the all-important status code, which we'll detail in just a minute.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=13.036) [And then a reason, which is essentially a textual description of the status.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=16.226) [Then you can have response headers and a response body, which might be HTML](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=21.216) [or image content or anything like that.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=25.936) [A full HTTP response might look like this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=29.386) [We're responding with a message that follows the HTTP/1.1 specification.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=35.866) [The status code is a 200, which is a good status code.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=40.476) [That means the HTTP transaction was successful.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=43.586) [And then there are some headers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=47.626) [There's a Cache Control, which essentially describes how this response can be cached.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=49.176) [Private means it's a private response for an individual user,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=53.946) [so it's okay for the browser to cache this response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=57.476) [But if there's any hardware in between the server and the client,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=60.316) [it shouldn't try to cache this for multiple users.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=63.146) [There's the content type, which is the mime type that describes the type](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=67.246) [of response you're receiving -- what's in the body --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=71.026) [and what character set it is encoded with.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=73.346) [And you can have it a date, you can have a content length, which allows the client to know](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=76.016) [when it is has received the end of this message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=81.446) [And there's also some extensions that you see in this response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=83.826) [ASP.NET and IIS like to plug in their own headers, just to advertise the fact](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=87.856) [that this website is running on Microsoft technology.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=93.276) [Since the content type in this response is text/HTML,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=96.296) [we should expect to find HTML in the body of the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=7&mode=live&start=101.556)

[Status Codes](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live)

[The status code that we saw in that previous response is very important,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=1.896) [because it tells the client the result of the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=5.476) [Did it work?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=8.496) [Did it not?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=9.096) [Is there something else to do?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=9.736) [Every status code that is standard falls into one of these five categories.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=11.316) [If the status code is in the range of 100 to 199 inclusive, it's an informational status code.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=15.656) [The 200 range is the good range.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=22.586) [That means the request was successful.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=24.346) [Anything that starts with a 3 is going to be some sort of redirection,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=26.656) [either a permanent redirect or a temporary redirect.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=30.546) [400 means the client did something wrong.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=33.566) [It might have been a bad request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=36.276) [It might have been a request for a resource that doesn't exist.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=37.766) [And 500 and up means something went wrong on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=40.946) [There was an application logic error, an unknown exception, the server is on fire.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=43.996) [And here are some of the common status codes that you'll see.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=49.046) [Status code 200 -- reason OK -- is the best one.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=52.256) [That means everything was successful.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=55.506) [301 is the redirection that you issue from the server, when you want the browser to go](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=57.206) [to another location to find the resource and never check the original location.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=62.756) [That's done for search engine optimization quite a bit.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=67.666) [That's what we saw demonstrated in the beginning with our Telnet session.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=70.286) [We had a 301 redirect.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=73.866) [That's slightly different than a 302 redirect.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=75.396) [That means the resource has moved, but it's okay to check that location again,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=78.556) [to see if the resource is there some time later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=82.926) [I'll show you a specific example of where a 302 redirect happens here, in just a minute.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=85.676) [304 means you've requested a resource and you've said, if it hasn't changed since such](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=91.356) [and such a date, with the If-Modified-Since header,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=97.116) [then don't make me pull down the full resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=100.526) [In that case, if the server detects that, indeed, the resource hasn't changed,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=102.496) [it'll just send back a 304, not modified, which means use whatever you have cached locally.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=106.376) [It's still good.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=112.756) [The 400 series of errors include 400, bad request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=113.856) [That's what happened if you perhaps send an HTTP request that's not using the proper syntax.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=117.086) [401 is an unauthorized request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=122.036) [The client might need to provide some credentials,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=125.856) [before they can access this resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=128.126) [We'll talk about security in a later module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=129.906) [403 is just a flat-out refusal.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=132.516) [You've tried to gain access to something that we do not want you to have access to,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=134.486) [and there's no possibility to get to this resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=139.156) [And then there's the infamous 404, which means you've requested something that isn't there.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=141.926) [The server couldn't locate it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=146.236) [404 is considered a client error.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=147.636) [The two most popular server errors are 500, meaning internal server error.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=150.696) [That could be because you had an exception inside of your application code,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=155.506) [and the server was unable to complete the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=159.766) [It could also be a bug or a problem in the server software itself.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=162.776) [And then there's a 503 status -- service unavailable.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=166.396) [Some services will return a 503, when they are under heavy load](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=170.106) [and cannot handle any additional connections, cannot process any additional requests.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=174.056) [And it's essentially telling the client, we're having a problem, please try again later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=179.156) [And now that we know a lot more about the request message and the response message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=184.806) [let's actually use a tool that can show us real requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=189.396) [and responses in a browser-server interaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=8&mode=live&start=192.796)

[HTTP Fiddler](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live)

[In this section, we're going to use a tool called Fiddler.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=1.326) [Fiddler is a free tool that you can download.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=4.206) [It runs on Windows.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=6.166) [And what it will do is intercept all the HTTP traffic between your machine](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=7.226) [and some distant server, or even a server that's running on the same machine,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=11.936) [and allows you to inspect every HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=15.666) [And it's actually a lot more advanced than that.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=18.706) [You can build your own requests.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=20.466) [You can write some scripts that manipulate requests.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=21.896) [But we're just going to capture some requests and see what some real HTTP messages look like.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=24.466) [I already have Fiddler up and running.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=29.456) [On the left-hand side we'll see HTTP transactions as they occur.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=31.056) [Currently, it's configured just to capture traffic from Web browsers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=36.136) [I can toggle that by clicking the button down here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=39.326) [And on the right-hand side, we'll be able to inspect the request message --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=41.586) [and we're going to do that with a raw view -- and also inspect the response message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=46.516) [We'll get a raw view of that, too.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=51.036) [So let's jump into the website we were looking at earlier and go to the default.cshtml file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=55.096) [That's the file that had an anchor tag here, to present a link,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=60.116) [so that the user could click and go to the signup page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=63.966) [I've also added an image to this page, so we'll see how that behaves.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=66.736) [I'm going to open this in Internet Explorer, since we've already seen some of the request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=70.936) [and response headers in the slides, and they were from Chrome.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=75.036) [So we'll see how IE is a little bit different.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=78.376) [And now the site is up and running in IE.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=80.356) [We've made a request to localhost/default.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=82.756) [If we look over here in Fiddler, we can see there were two requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=88.466) [that were sent off for that page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=92.096) [This third one came from another browser instance that's running.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=93.396) [I'm going to delete that, by selecting it and hit the Delete key.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=96.716) [We just really want to inspect these first two requests.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=99.826) [The first request was a get request for default.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=102.586) [You can see my accept language is in there.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=105.976) [You can see IE basically has an Accept header that says give me anything.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=108.446) [And of course, it has the required Host header at the end.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=112.266) [And down here, in the response, what we see is a 200 okay response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=115.486) [That means everything worked.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=121.286) [We can see a couple X- headers that ASP.NET and IIS inserted.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=123.206) [And we can also see the HTML that makes up the page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=128.116) [The second request was when the browser encountered the image and said, ah,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=131.436) [I need to go out and fetch DuPont.jpg.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=135.086) [So it issues a get request for DuPont.jpg.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=138.606) [And down here, in the response, it's mostly binary, so we can't really view this in Fiddler.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=141.826) [We can see that the content type was set to image/JPEG.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=148.446) [There was a last-modified header sent to the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=152.806) [That's very important.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=155.096) [What the client can do now is it realizes the date at which that picture was created.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=156.396) [It can save that photo.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=161.346) [It can save the date.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=162.626) [And it will never need to download that again, as long as it has it on the local file system.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=163.696) [In fact, if we come back to the browser and I issue a refresh, you'll see, again,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=168.766) [we have two requests that go out.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=173.676) [The first one was for default.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=176.336) [And again, we got the HTML back.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=179.716) [The second one was for the JPEG image, but this time IE set up a header that said, basically,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=181.906) [only give me this if it was modified since April 2nd, 2010.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=187.506) [And the browser responded with an HTTP message that has a 304 status code,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=192.366) [says essentially that resource has not been modified, so feel free to use your local copy,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=198.446) [instead of me pushing all those ones and zeros to you again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=203.446) [Now let's take a look at what happens when we go to the sign-up page, and I'm going to fill](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=206.906) [out my first name and my last name --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=215.026) [and the capital letters are okay -- and hit Submit Query.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=219.496) [And I've been signed up.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=224.176) [Let's see what happened since our last interaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=226.016) [First, there was a request for signup.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=229.326) [The browser returned the HTML that included the form tag and the input tags,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=233.826) [where I could fill out my first name and last name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=237.796) [And then, the next step was the browser did a post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=239.886) [So the form method was equal to post.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=245.146) [When I hit that Submit button, the browser had to put together a post request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=247.036) [You can see that this request message actually includes a body,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=252.136) [and the body is the main value pair, so the inputs that were in that form.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=255.736) [So first name equals Scott, and last name equals Allen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=260.016) [When that request arrived at the server, we did some work inside of the logic of the application](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=262.866) [in the C# source code to do some things with the database or a session variable.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=269.136) [And then we did a response.redirect.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=273.176) [And a response.redirect generates an HTTP response](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=275.876) [from the server, with a status code of 302.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=279.546) [If you remember, 302 is that temporary redirect.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=283.476) [So we're telling the browser, well, you wanted this signup.cshtml resource,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=286.156) [but really what you need to do -- just this one time --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=291.126) [is instead go to this location, signedup.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=294.116) [So that's a temporary redirect, much different from the 301 status, which is,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=298.566) [you wanted this resource, but you need to always go](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=304.306) [to this other place, and don't come back here again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=306.626) [302 is just temporary, because what we're trying to do --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=308.876) [if you remember from the beginning of this module --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=311.926) [is implement that post-redirect-get pattern, so that the user is left on a page](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=314.276) [that is displayed as the result of a get request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=318.936) [And that's this get request, the last request that was sent out to the URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=323.286) [that was specified in the 302 response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=328.276) [And now, as a user, I can happily refresh that page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=331.666) [All it's doing is sending off a get request and displaying my sign-up results](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=334.846) [that have been saved somewhere -- persisted in a database, perhaps.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=338.906) [Now, to be thorough, let's also see what happens if I request a resource that doesn't exist.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=344.356) [Let's just ask for something.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=350.056) [That's the 404 response -- resource not found.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=354.886) [And let's also flip over into Web matrix.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=358.406) [And in the default page, I'm going to add an expression for a C# variable that doesn't exist,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=361.846) [and save that file, and see what happens when we come into default.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=369.126) [And this is a compilation error that displays in the browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=378.696) [And over here, in Fiddler, we can see that that returned an HTTP status code of 500,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=382.736) [which is internal server error -- something went wrong.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=390.716) [Now, one quick note on this 500 status code.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=394.186) [An HTTP status code of 500 means there was an error on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=396.716) [But it's really indicating something at the HTTP level.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=401.136) [It doesn't necessarily reflect what's happening inside your application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=404.306) [For instance, imagine that sign-up form that we have,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=408.466) [if the user didn't fill out the last name field.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=411.116) [The application probably requires the last name field to be present,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=413.356) [or it's not going to be able to create some account.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=417.616) [That doesn't mean that you have to return an HTTP error code indicating failure,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=419.826) [like an HTTP 500 server error or an HTTP 400 bad request, because, really,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=424.916) [things are working at the HTTP transaction level.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=430.956) [It's just that the user didn't give you all the information that you need](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=433.946) [for the business operation to complete.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=437.436) [So probably, what you want to do there is return some HTML with a normal 200 okay status code,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=439.626) [or just add some markup to the page, to tell the user that,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=446.226) [sorry, we couldn't create the account.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=449.436) [You forgot to provide a last name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=451.136) [This field is required.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=453.136) [Please do that and try to submit -- and click the Submit button again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=454.536) [From an application perspective, the request was a failure.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=457.866) [But from an HTTP perspective, the request was successfully processed.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=461.866) [So, those types of scenarios are normal in Web applications.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=9&mode=live&start=467.106)

[Summary](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live)

[In this module, we learned that HTTP messages always come in pairs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=2.486) [First there is the request, then there is the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=6.436) [The information inside of these messages is all in readable text.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=9.646) [And there are lots of tools that you can use](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=13.116) [to inspect HTTP requests being made on your machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=14.976) [Fiddler is one such tool.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=18.316) [That's the tool I demonstrated.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=19.626) [But most browsers also have developer tools that you can plug in, to give you a view](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=21.256) [of the HTTP requests that are coming and going.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=25.736) [That includes Firefox, Chrome and Internet Explorer.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=27.976) [The messages that we've looked at, they've all been engineered,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=32.066) [to make sure that both parties understand what they're receiving.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=34.646) [The first line of that message is always explicit about its intent.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=38.586) [There's either an HTTP method there in a request that expresses what that message wants](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=42.856) [to do -- get something or post something.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=46.996) [And there's a response with a status code on that first line that says,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=48.956) [did this work out or not, or what do I do next.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=53.036) [In the next module, we're going to go one step lower and actually take a look](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=57.366) [at when these connections are opened to send these messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=60.846) [and how they travel across the network.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m2-messages&clip=10&mode=live&start=64.326)

[HTTP Connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live)

[In the previous module, we looked at HTTP messages, and we saw examples](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=2.516) [of the textual command that flowed between the client and server in an HTTP transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=6.216) [But, how do those messages actually move through the network?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=11.646) [When are the network connections opened?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=14.516) [When are the network connections closed?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=16.086) [Those are the types of questions that we'll be answering in this module,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=18.186) [as we look at HTTP from a lower level perspective.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=21.156) [We're going to look at network protocols like the transmission control protocol and use a tool](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=24.566) [to analyze the network during an HTTP transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=29.236) [We're also going to get a feel for what it might be like to write the code](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=32.236) [in a web browser that makes an HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=0&mode=live&start=35.346)

[Whirlwind Networking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live)

[To understand HTTP connections, we have to know just a bit about what happens](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=2.086) [in the layers underneath the HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=5.746) [Network communication protocols, the things that move information around the internet,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=7.746) [they're like most business applications, they consist of layers,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=13.146) [each layer in a communications stack is responsible for a specific](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=16.646) [and very limited number of responsibilities.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=20.256) [For example, HTTP is what we call an application layer protocol](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=22.666) [because it allows two applications to communicate over the network.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=27.476) [Quite often, one of the applications is a web browser](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=32.026) [and the other application is a web server, like IAS or Apache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=34.696) [And, we saw how HTTP messages allow the browser to request resources from the server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=39.086) [but those HTTP specifications don't say anything about how the messages actually move](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=44.756) [across the network and reach the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=49.456) [That's the job of lower layer protocols.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=51.406) [A message from a web browser has to travel down through a series of layers and when it arrives](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=54.646) [at the web server, it travels up through a series](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=60.216) [of layers to reach the web server process.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=62.536) [So, the layer underneath of HTTP is what we call a transport layer protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=65.316) [Most all HTTP traffic travels over TCP, which is short for transmission control protocol,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=70.676) [although that's not technically required by HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=77.386) [When a user types a URL into the browser, the browser first has to extract the host name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=79.776) [from the URL and the port number, if there is any, and it opens a TCP socket,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=85.336) [by specifying that server address, which was derived from the host name and the port,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=90.776) [which as we saw, will default to port 80, then it just starts writing data into the socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=95.446) [We're actually going to see code that does this in a little bit.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=99.776) [All the browser needs to worry about is writing the proper HTTP message into the socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=102.746) [The TCP layer accepts that data and ensures that the data gets delivered to the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=108.496) [without getting lost or duplicated.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=113.376) [TCP automatically resends any information that might get lost in transit.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=115.736) [The application doesn't have to worry about that](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=119.846) [and that's why TCP is known as a reliable protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=122.066) [In addition to this error detection, TCP also provides flow control,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=126.106) [meaning TCP will ensure the sender does not send data too fast](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=130.126) [for the receiver to process that data.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=133.526) [Flow control is very important in this world](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=136.216) [where we have different kinds of networks and devices.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=138.236) [So, in short, TCP provides many of the vital services that we need](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=141.746) [for the successful delivery of HTTP messages, but it does so in a transparent way](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=145.106) [and most applications don't need to worry about TCP at all,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=149.926) [they just open the socket and write data into it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=153.116) [But TCP is just the first layer beneath HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=156.226) [After TCP at the transport layer comes the IP as a network layer protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=160.256) [IP is short for internet protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=168.176) [And so while TCP is responsible for error detection, flow control,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=170.536) [and overall reliability, IP is responsible for taking pieces of information and moving them](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=174.726) [through all the switches, routers, gateways, repeaters, and all of these other devices](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=180.326) [that move information from one network to the next and all around the world.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=185.086) [IP tries very hard to deliver the data at the destination,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=188.866) [but it doesn't guarantee delivery, that's TCP's job.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=192.136) [To do its work, IP requires computers to require an address, which is the famous IP address,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=196.936) [an example would be 208.192.32.40, that's an IP version four address.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=201.966) [IP is also responsible for breaking data into packets, which sometimes we call them datagrams,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=208.286) [and sometimes it needs to fragment and reassemble those packets so they're optimized](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=214.046) [for a particular network segment.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=218.416) [Now, everything we've talked about so far happens inside a computer,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=220.826) [but eventually those IP packets have to travel over a piece of wire or fiber optic cable](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=223.986) [or wireless network, or over a satellite link,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=229.986) [and that's the responsibility of the datalink layer.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=232.376) [A common choice of technology, at this point, is Ethernet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=235.356) [With Ethernet, these IP packets become frames and protocols like Ethernet become very focused](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=238.846) [on ones and zeros and electrical signals.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=244.706) [Now, eventually that signal reaches the server and it comes in through a network card](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=247.106) [where the process is reversed, the datalink layer delivers the packet to the IP layer,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=251.506) [which hands it over to TCP, which can reassemble the data into the original HTTP message sent](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=256.666) [by the client and eventually push it into the web server process.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=262.116) [It's all a beautifully engineered piece of work.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=266.556) [It's all made possible by standards.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=268.696) [( Pause )](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=1&mode=live&start=272.016)

[Programming Sockets](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live)

[I thought it would be interesting to write a little C sharp application](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=2.206) [that kind of behaves like a web browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=5.526) [It's going to kind of behave like a web browser in the sense that I'm going to give it a URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=7.666) [and it's going to go off and use some of the lower level classes in dot net to retrieve](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=12.076) [that resource and display it here on the screen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=18.226) [So, it's called console application four because it's a very simple exercise,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=20.606) [we're not going to do a lot of error checking, we're only going to be able](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=24.886) [to display textual resources, but we will get to see how to make an HTTP request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=27.786) [and process the response from a low level.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=33.116) [And, we're not going to use any of these high level classes in dot net like web request,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=35.346) [which makes this really easy, we're going to use the lower level stuff like sockets.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=39.606) [So, I already have some code written in this application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=43.746) [One of the parts that is written is that we're going to assume that the user passes the URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=48.816) [to the resource that they want to retrieve as a command line parameter, and we're going to grab](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=53.396) [that parameter and initialize a new URI class with it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=57.756) [Now, URI stands for uniform resource identifier and it's a little more generic than a URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=61.866) [because it can identify a resource by either name or location, but a URL is a URI,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=67.216) [therefore when the user types in a URL, we can stick it in the URI class](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=72.546) [and this class is helpful because it helps us parse apart that strain.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=77.466) [And the three basic steps to this program are to grab the URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=81.296) [go out and retrieve the resource identified by the URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=85.806) [and then we'll write it out to the screen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=89.596) [So, again, just textual resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=91.896) [So, the second step here, get resource, what we're going to need to do is,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=95.236) [just like a web browser, find out some information](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=99.406) [about what the user is trying to connect to.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=102.136) [For instance, we're going to have to find out what the host is,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=104.106) [and the URI makes this very easy because I can just go to the host property](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=107.166) [and it's going to parse out odetocode.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=111.726) [We can also find what resource they want to connect to.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=114.066) [That's going to be in the path inquiry, and if you remember the first module in this course,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=118.346) [we talked about the path portion of the URL, the query string portion of the URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=123.816) [we're going to bring both of those in and put it in this resource,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=128.336) [which will be a string typed variable.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=131.116) [And, now we need to find out more information about the host.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=133.746) [We need to find out what the IP address is of the host, we need an IP address in order](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=138.286) [to be able to create a socket that will connect to that host.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=144.106) [And this is fairly straight forward.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=147.106) [What I am going to do is pull out the host entry, by connecting to a DNS server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=149.636) [and this is very easy because it's just a static method on the DNS class.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=154.896) [I give this method the host name, it's going to return a host entry which can be one](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=162.646) [or more addresses that are available for this server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=167.666) [So, we're going to take this entry and we're going to pass it](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=171.496) [into a method called create socket, and it's our job inside of here to connect to HTTP port 80](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=174.306) [and actually open up a socket where we can exchange HTTP messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=180.586) [So, it would also be good if I took the URL that the user typed in and check to see](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=184.326) [if they used a port other than 80, but again this is a simple program,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=189.456) [we're just going to assume that they went for an 80.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=193.116) [So, I'm going to need an end point to connect to that server, and there is a class](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=196.896) [within the dot net framework called IP end point that I can use to, basically,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=203.166) [construct a data structure that describes what I want to connect to.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=208.736) [And, you can see it needs an address and it needs a port number.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=212.356) [So, the address I'm going to get from the host entry,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=215.926) [and again you can have multiple IP addresses available for a server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=218.826) [Since this a quick and simple program, I'm just going to use subzero](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=224.256) [or just just give me the first address that's the address that we're going to use,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=227.496) [and we're going to connect using port 80.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=231.246) [And once I have an end point, I can construct a socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=234.616) [First, I have to specify the address family, this would be something](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=239.846) [like does it use IP version four or IP version six, the end point will tell us that.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=245.286) [I want it to be a streaming socket, and I want it to use a protocol that we've talked](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=251.816) [about already and that's the transmission control protocol, TCP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=259.096) [Now, the socket has everything that it needs to connect, so we can tell it to connect,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=265.186) [and tell it to connect to the end point that we've constructed earlier.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=272.246) [And that's a block and call by the way, so the code will be stuck on that line](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=278.246) [until it actually makes that connection to the server or fails or times out,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=284.616) [and we can check if it actually did connect by walking up to the connected property](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=288.416) [on the socket and if that return is true we have a a real socket available, I'll go ahead](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=294.706) [and return that socket for someone else to use.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=298.436) [Now back here in get resource, we've implemented create socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=302.156) [When we get a socket what we have to do is send the HTTP request message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=307.376) [to that host for that particular resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=311.616) [So, if we look at send request then this bit of code should look relatively familiar](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=314.606) [in the sense that it looks like an HTTP request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=320.486) [The only type of message we're going to send, the only operator we're going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=324.476) [to use is the get operator, we want to use the HTTP one dot one specification,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=327.536) [we have to fill in the path and query string here of what we want, we're going to fill](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=332.126) [in the host name so that we have the required host header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=335.366) [and then the request message basically has to end](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=338.026) [with two consecutive carriage return line feeds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=342.296) [Now, we have to take this message, which is a which is in a string representation and turn it](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=344.586) [into bytes to actually write it into the socket, and that's easy enough](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=350.946) [with encoding.asking.getbytes that's going to turn it into the bytes using an asking encoding,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=354.356) [and this is the beautiful part right here, all we've really been worried](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=359.666) [about is formulating the message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=364.116) [We can walk up to the socket and say here's the data that you have to send,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=366.696) [now everything is on you, you make sure it gets delivered,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=371.066) [it doesn't get duplicated, it doesn't get lost.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=373.986) [Sure, there might be a network error and the whole operation might fail,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=377.146) [but if something strange happens and a few bits get changed on the way over to the other server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=380.996) [because of electrical interference, then TCP will detect that](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=386.136) [and just automatically resend data for me, I don't have to worry about it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=389.936) [Again, this is a blocking call so it will sit on this line of code until the send finishes.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=393.706) [There's also asynchronous versions that you can use and that would be better](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=398.406) [if you were writing a real application, but once we've sent the data, then we'll come back](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=403.216) [up here, once we've sent off the HTTP request, then we wait for the HTTP response,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=408.796) [we're going to listen for that response on the same socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=414.476) [So, if I scroll down to this bit of code, then it looks like I threw](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=418.226) [in an extra curly brace here for some reason, but it's basically having a buffer](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=421.896) [where we can stuff information into, we're going to tell the socket to receive as much data](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=427.466) [as this buffer will hold, but we're not sure if we need 256 bytes](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=432.686) [or if we need one million bytes, so we're just going to set up a loop and keep refilling](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=437.406) [that buffer, which will be full of bytes, and each time the buffer fills up,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=442.736) [we'll use the encoding class again to take the data that's inside of that buffer and convert it](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=448.506) [into a string, I'll pin it here to a string builder, and we're going to keep doing](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=453.436) [that until the socket says well we did a receive](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=457.036) [but didn't receive anything the response is finished.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=460.796) [And, at that point, we can take the result, turn it into a string, and so now if I do a build,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=463.406) [we should be able to execute this program and there it returns some HTML from the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=471.166) [So really not a lot of code to write at this low level,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=478.226) [and of course we haven't built a really robust web browser, we've just built something](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=481.456) [that can get a resource, a textual resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=487.676) [But I just want you to think of all the beautiful things](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=491.866) [that are happening behind things like socket.send the error detection,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=493.796) [the flow control, the fragmentation and reassembly of packets, moving electrical signals](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=497.896) [across wires and then across the country and processing all this,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=503.096) [it's all made very very easy by the network protocols that are in place](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=507.056) [and the programming API that they have specified](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=511.106) [and that is implemented by the dot net framework.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=514.036) [( Pause )](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=2&mode=live&start=516.516)

[Handshakes with a Shark](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live)

[If you want some visibility into TCP and IP you can install a program like Wire Shark.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=2.046) [This is a free program for OSX and Windows.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=6.566) [In the last module we used Fiddler to examine HTTP messages that were being exchanged](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=9.506) [between the client and the server, but Wire Shark goes much deeper than this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=14.156) [You can examine every bit of information that's flowing through your network interfaces.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=18.176) [Using Wire Shark, we're going to be able to see the TCP handshake, these are the TCP messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=22.426) [that are required to establish a connection between the client and the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=27.666) [and that happens before the actual HTTP messages can start to flow.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=31.236) [You can also observe TCP and IP headers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=35.336) [They add 20 bytes each on top of every message, and what I'd like to do is take a look](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=38.756) [at the program that we just wrote while Wire Shark is running to see what gets exchanged.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=43.466) [I've configured the application to run in the debugger now, the command line argument is going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=48.306) [to specify a URL that says just get the root resource for www.odetocode.com,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=52.936) [now if you remember from module two, everything on odetocode.com make sure that it gets](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=59.466) [and redirects resources to make sure they come from odetocode.com and not www.odetocode.com](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=64.726) [so this request should generate a simple redirect response from the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=71.186) [So, let's get started with Wire Shark.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=76.496) [The first thing I'm going to do is specify some capture options.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=79.466) [In the capture options I'm going to use a filter here to say only capture stuff](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=82.646) [between this computer and the host odetocode.com and it's going to be able to figure](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=88.036) [out what the IP address is for that host and capture all the traffic.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=92.306) [I don't want to capture everything, because when you run Wire Shark](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=95.696) [without any filter you'll find out that your network card is probably busier](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=99.446) [than you thought it was with all the little services and synchronization and chat windows,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=103.686) [they're all connecting to something.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=108.446) [So, let's start Wire Shark and let me come into Visual Studio](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=110.666) [and start our program with the debugger.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=119.126) [So, we're at the point where we are about to connect with a socket,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=121.196) [let me just step over that line of code and we see](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=124.906) [that there are three new entries behind us here in Wire Shark.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=128.226) [We'll come back and look at them later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=131.296) [Now, let me advance to the point where we actually send off the get request,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=133.426) [this is the HTTP request message, I will step over that.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=137.926) [We have three new entries that popped up here in Wire Shark and let's just run to completion](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=142.446) [where we read the results, and finally just exit the application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=147.396) [And, let me stop the capture, just so we don't get any more messages that are captured.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=151.676) [All right, not let's drill into what we have.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=159.676) [The first message here is a message that was sent from 192.168.1.134,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=163.806) [which is the private IP address of my computer here in the local area network](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=170.586) [at the Allen Estate in Western Maryland.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=174.786) [That message was sent from me to 96.31.33.25, which I'm going to assume is the IP address](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=176.536) [of the server hosting odetocode.com](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=184.106) [and it was sent using the TCP protocol, there's no HTTP involved yet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=186.196) [Here in the bottom of the window you can see the nitty gritty details](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=190.926) [of what was sent using the transmission control protocol and also what TCP put into the message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=194.476) [what did the IP protocol put into the message, what happened at the Ethernet level.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=202.106) [And I'm not going to go into all the details of sequence numbers and datagram headers](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=208.106) [and the like because we're primarily focused on HTTP and what I really want you to take away](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=213.496) [from this discussion is that we exchanged three messages before the HTTP traffic started](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=218.066) [to flow.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=224.386) [So, three messages, this is known as the TCP handshake, the three step TCP handshake,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=225.116) [it's the handshake protocol to make sure both the server and the client are](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=230.316) [in agreement about how to communicate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=233.676) [It's not until the handshake completes that we start sending HTTP messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=235.986) [So, this was the message that I sent out that was the get request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=242.516) [or host www.odetocode.com you can see that that get message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=246.206) [that HTTP request message is layered into a TCP message, which also IP adds its own headers here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=251.736) [and so does Ethernet and that's what the layered communications stack,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=259.506) [that's how it does its job.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=263.056) [It encapsulates and surrounds data from a higher level inside of information that it uses to do,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=264.416) [let's say error detection at the TCP level or routing at the IP level.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=269.656) [So, that was the outgoing request message, here was the incoming response messages that says,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=273.536) [essentially, this is a status code 301, the resource is moved permanently,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=280.106) [my computer acknowledged that and then the final line that is in red is a bit of a concern,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=286.066) [and it sort of indicates that I didn't write my HTTP client correctly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=291.676) [What happened is my client expected the server to keep that socket open and stay connected,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=296.026) [but something must have happened on the server side and it closed the socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=301.446) [I was expecting it to be open, at the TCP level this generated a reset,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=305.106) [and that actually leads nicely into the next discussion](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=310.166) [about HTTP connections and HTTP performance.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=314.266) [As you can see, HTTP relies almost entirely on TCP to take care of all the hard work,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=317.896) [and TCP does involve some overhead, like the handshakes that we can see here in Wire Shark.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=324.406) [And thus the performance characteristics of HTTP, they're mostly also going to rely](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=329.196) [on the performance characteristics of TCP and that's what we're going to talk about next,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=335.446) [and we'll also talk about why that red line appears,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=340.626) [why did the server close the connection on me.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=3&mode=live&start=343.666)

[On the Evolution of HTTP](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live)

[In the early days of the web when we had the original HTTP specification,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=2.586) [most resources were textual and you would go out with your computer](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=6.886) [and you would request a document from a web server, the web server would give it back](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=11.036) [to you, and you could go off and read for five minutes before maybe you'd click a link](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=14.696) [on that document and request another one.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=19.146) [The world was very simple then, and it was really easy for a browser to open a connection](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=22.136) [to a server, send a request, receive the response, and then just close the connection.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=26.626) [The idea was, why do we keep connections open if we only need them once every five minutes?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=31.136) [But for today's web, most web pages require more than a single resource to fully render.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=36.676) [Every webpage I go to is going to have one or more images, one or more JavaScript files,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=41.586) [one or more CSS style sheets, it's not uncommon to request a webpage and have that spawn off 30](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=45.596) [or 50 or 100 additional HTTP requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=51.656) [to retrieve all the resources associated with that page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=55.176) [So, if today's web browsers were to open connections one at a time like this and wait](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=58.896) [for each resource to fully download before starting the next download,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=63.636) [then the web would feel very very slow because the internet's fully of latency,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=67.426) [signals have to travel long distances and wind their way through different pieces of hardware,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=71.626) [and as we saw on Wire Shark, there's also some overhead](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=76.066) [in establishing a TCP connection, the three step handshake.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=79.176) [Let me demonstrate what happens if I'm running Fiddler and I go out](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=82.676) [and I refresh the Wire.com homepage.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=88.776) [So, there's the initial request and as it's pulling that down,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=91.626) [it's discovering other resources to download, things are filling in slowly now,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=94.986) [you can see the requests rolling by.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=102.036) [A lot of them have a 304 status code, because they are for images](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=103.986) [that have already been downloaded and cached by IE, but now we're up to](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=108.236) [over 100 requests 120 requests to fully render the Wire.com homepage.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=112.136) [So, this evolution from simple documents](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=118.126) [to complex pages has required some ingenuity in the practical use of HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=4&mode=live&start=120.946)

[Parallel Connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live)

[Most user agents, aka web browsers will not make requests in a serial one by one fashion,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=1.346) [instead they can open multiple, parallel, connections to a server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=7.506) [So, for example, when downloading the HTML for a page, the browser might see two image tags](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=11.306) [in that page, so it can open two connections to download the images simultaneously.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=16.046) [Hopefully that will cut the amount of time needed to display the images in half,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=21.626) [but it's not always perfect like that, and the exact number of parallel connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=25.536) [that a browser will make depends on the browser and how it's configured.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=29.836) [For a long time we considered two as the maximum number](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=33.516) [of parallel connections a browser would create.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=37.456) [We considered two the max because the most popular browser](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=39.946) [from any year is Internet Explorer six, able to only allow two simultaneous connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=43.126) [to a single host, and to be fair,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=47.986) [Internet Explorer six was really just following the HTTP specification, which says,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=50.036) [a single user client should not maintain any more than two connections with a server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=55.016) [But, a lot of people found ways to work around this limitation,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=59.696) [or at least perceived limitation, to increase the number of parallel downloads.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=62.936) [So, for example, this two connection limitation is per host, per host name,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=67.126) [meaning IE six would happily make two connections to www.odetocode.com](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=72.826) [and two connections to images.odetocode.com, so by hosting images on a different server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=78.916) [then you can have four parallel requests,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=86.426) [and that different server just needed to be a different host name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=88.406) [Ultimately, your DNS records could point all four requests to the same physical server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=91.756) [but IE six was just using that two connection limit per host name,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=97.636) [it would happily open four connections in that scenario.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=101.446) [A lot of people also figured out how to go into the registry](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=104.496) [and make IE six support more connections.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=107.976) [Now, things are a bit different today, and most modern web browsers will use a different set](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=111.426) [of heuristics when deciding on how many parallel connections to establish.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=119.386) [So, for example, in IE eight you can now have up to six concurrent connections per host.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=123.026) [And the real question then is, well if six is better](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=128.266) [than two then why don't we just open 100 parallel connections?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=131.466) [Well connections and parallel connections, they're they're going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=135.196) [to obey the law of diminishing returns.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=138.826) [If you have too many connections open it can saturate and congest the network,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=141.426) [particularly when you're dealing with mobile devices and unreliable networks.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=145.716) [So, having too many connections can hurt performance,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=149.406) [and also a server can only accept a finite number of connections.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=152.476) [So, if 100,000 browsers simultaneously create 100 connections to a single web server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=156.886) [I'm sure that bad things are going to happen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=164.096) [Still, using more than one connection per agent is better than downloading everything](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=167.696) [in a serial fashion and parallel connections are not the only performance optimization in HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=5&mode=live&start=172.006)

[Persistent Connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live)

[In the early days of the web, it was easy for a browser to open and close a connection](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=1.156) [for each request it sent to a server and that is literally create a new socket, connect it,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=5.196) [send a request, get a response, and close the socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=10.026) [That was in line with HTTP's idea of being a completely stateless protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=12.526) [But, as we've seen, the number of requests per page has grown and the overhead generated](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=17.366) [by TCP handshakes and the in memory data structures required](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=22.066) [to establish each socket connection, it's not trivial.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=25.716) [So, to reduce the overhead and improve performance, the HTTP 1.1 specification suggests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=29.636) [that implementation should implement persistent connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=35.216) [and actually persistent connections are the default type of connection in HTTP 1.1.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=38.386) [A persistent connection stays open after the completion of one request response transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=45.076) [That leaves the browser with an already open socket it can use to continue making requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=50.326) [to the server, without the overhead of opening a new socket.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=55.566) [Persistent connections also avoid the slow start strategy that is part of TCP congestion control](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=59.676) [and that's going to make persistent connections perform better over time.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=65.336) [So, in short, these persistent connections that we have today with HTTP,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=69.316) [they typically reduce memory usage, reduce CPU usage, reduce network congestion,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=72.956) [reduce latency, they generally improve the response time of a page, but like everything](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=78.396) [in software there is always a downside.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=83.586) [A server can only support a finite number of connections, the exact number depends](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=86.206) [on the amount of memory, the configuration of the server, the performance of your application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=91.206) [There's a whole host of variables there.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=95.976) [So, it's difficult to give an exact number, but generally speaking,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=97.686) [if you're talking about supporting thousands of concurrent connections, you're going to have](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=101.536) [to start testing to see if a server will support that load.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=105.966) [Many servers are configured to limit the number of concurrent connections far below the point](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=109.966) [where the server will just fall over.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=114.556) [And that configuration is as much a security measure as anything else.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=116.016) [It helps to prevent a denial service attack because it's relatively easy for someone](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=119.526) [to create a program or a script that will just open thousands of persistent connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=124.386) [to a server and not do anything with them, or send a minimal amount of data](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=128.196) [over over the connections, so persistent connections are performance optimization,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=131.396) [but some people also see them as a vulnerability.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=136.976) [So, thinking along those lines of persistent connections possibly being a vulnerability,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=141.016) [we've talked about them remaining open, but for how long?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=145.946) [In a world where you have infinite scalability, you can keep the connections open as long](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=149.696) [as you want, but because a server supports a finite number of connections,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=153.386) [most servers will be configured to close a persistent connection](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=157.726) [if it's idle for some period of time.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=160.476) [For example, in the most recent Apache release, I know the default time out is five seconds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=162.616) [User agents can also close connections after a period of idle time.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=168.716) [If you want visibility into actual physical connections that are being opened](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=172.946) [and closed you can use a network analyzer like Wire Shark.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=176.526) [In addition to aggressively closing persistent connections,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=180.356) [most web server software can also be configured to not enable persistent connections.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=183.896) [That's common with shared servers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=188.496) [Shared servers are sacrificing performance because they're hosting hundreds of websites](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=190.976) [on the same machine, they're sacrificing performance to allow as many connections](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=195.156) [as possible, and because persistent connections are the default connection style with HTTP 1.1,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=199.336) [a server that does not allow a persistent connection has](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=205.766) [to include a connection header in every HTTP response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=208.636) [That response header is connection close, that's a signal to the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=211.936) [that the connection will not be persistent and it should be closed as soon as possible,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=216.786) [the agent is not allowed to make a second request on the same connection.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=220.676) [That's something I should have checked for in my HTTP client, I should have seen](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=224.006) [if there was a connection close header,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=227.356) [and immediately closed the socket after receiving the data.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=229.036) [Where can we see the difference?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=231.846) [Well let's go to Fiddler and have Fiddler running and capturing](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=234.606) [and let's actually make a request to odetocode.com and if we inspect that one](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=238.226) [of the headers that we'll see in the response is the connection close header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=243.816) [because it is hosted on a shared website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=248.626) [And, just for comparison, if we go to Pluralsight.com, then in the response](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=250.556) [that comes back, we will not see connection close,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=260.036) [it's going to allow a persistent connection.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=262.966) [One additional optimization that I want to mention is the pipeline connection.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=269.656) [Now, persistent and parallel connections are both widely used and supported by clients](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=273.846) [and servers, but the HTTP specification also allows for pipeline connections,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=277.896) [which are not as widely supported by either servers or clients.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=283.136) [In a pipeline connection a user agent can send multiple HTTP requests on a single connection](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=286.746) [and send those off before it even waits for the first response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=292.606) [Pipelining allows for more efficient packing of requests and to packets and can reduce latency,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=296.576) [but like I say, it's just not as widely supported](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=302.096) [as parallel and persistent connections.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=304.196) [( Pause )](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=6&mode=live&start=306.016)

[Summary](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live)

[In this module we took a look underneath the HTTP messages and got an idea](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=2.576) [of how messages actually move across the internet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=6.046) [We talked about some of the performance optimizations that are made possible](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=9.126) [by the HTTP specifications and we wrote a little program to open a socket,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=12.186) [sent off an HTTP request, and received an HTTP response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=16.706) [In the next module we're going to take a step back and look at the internet](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=20.516) [from a wider perspective and talk a little more about the hardware that is out there](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=23.536) [on the network that can influence our HTTP messages and HTTP transactions.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m3-connections&clip=7&mode=live&start=27.486)

[HTTP Architecture](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live)

[Hi, this is Scott Allen, and this module is about HTTP and Web architecture.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=1.796) [In the first module of this course, we talked about resources, but I mostly focused](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=6.876) [on URLs and how to interpret a URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=10.476) [But resources are really the centerpiece of HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=13.216) [And now that we understand HTTP messages, methods, and connections,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=16.156) [we can return to look at resources in a new light.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=19.986) [In this module, I want to show you the essence of working with the resources and messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=22.956) [and how the architecture of the Web really works.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=0&mode=live&start=27.656)

[Resources Redux](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live)

[It's really easy to think of a Web resource as being a file on the Web server's file system.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=2.086) [But thinking along those lines really disrespects the true capability](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=6.686) [of the resource abstraction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=9.746) [Many Web pages do require physical resources on a file system:](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=11.466) [JavaScript files, images, stylesheets.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=15.686) [However, consumers and users of the Web don't really care for those background resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=18.316) [Instead, they care about the resources they can interact with and -- more importantly --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=23.136) [the resources they can name; for instance, resources like the recipe for Beef Wellington,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=26.626) [the search results for deep dish pizza, and Patient 123's medical history.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=32.696) [All of these resources are the types of resources that we build applications around,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=37.716) [and the common theme in the list is how significant each of these items is,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=41.926) [if they're significant enough that we want to identify them and name them.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=45.536) [And as soon as we can identify a resource, we can also give the resource a URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=49.496) [for someone to locate the resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=53.646) [And a URL is a handy thing to have around.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=55.816) [Given a URL, I can locate a resource, of course.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=58.816) [But I can also hand the URL to someone else,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=61.726) [by embedding it in a hyperlink or sending it in an e-mail.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=64.306) [But there's many things I cannot do with a URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=67.946) [Or, rather, there are many things that a URL cannot do.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=70.566) [For instance, a URL cannot restrict the client or the server to a specific type of technology.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=74.506) [Everybody speaks HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=81.016) [It doesn't matter if your client is in Ruby and your server application is written in C++.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=82.516) [It doesn't matter.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=87.716) [Also, a URL cannot force the server to store the resource using any particular technology.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=88.856) [The resource could be a document on the file system, but a Web framework could also respond](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=95.526) [to an incoming request for that resource and build it, using information stored in files,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=100.496) [stored in databases, retrieved from other Web services,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=104.976) [or simply derive the resource from the current time of day.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=108.156) [Another thing a URL cannot do is specify the representation of a specific resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=113.036) [And a resource can have multiple representations.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=117.616) [There could be one in HTML, one in PDF, one in English, one in French.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=120.296) [I demonstrated this in the second module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=124.916) [We sent different accept language headers to a server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=127.226) [and we watched it respond in different languages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=130.386) [I also wanted to show you what happens when you send different accept types; that is,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=133.556) [specify the representation that the client is willing to receive.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=137.996) [To do that, we'll go back to the console mode application that we wrote, in the last module,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=141.936) [to make HTTP connections using sockets.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=146.736) [And first, let's just demonstrate that we can go to Pluralsite.com,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=149.256) [and that returns an HTTP response of 301.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=154.656) [That's the permanent redirect, saying, no, you don't want to go here,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=158.266) [you want to go to http://www.pluralsite-training.net.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=161.506) [But I have modified this program slightly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=166.686) [What I've done is when we send off the HTTP get request, I'm putting an accept header in here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=170.406) [that says I want to accept application/XML.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=174.976) [Now, the server might not have an XML representation for any particular resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=178.056) [In fact, it turns out here that the server returned the content type of text/HTML.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=183.076) [And sometimes, as a client, you have to deal with what you're given.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=188.656) [But there are Web services out there, and Web applications,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=192.146) [that respond to that accept header appropriately.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=195.506) [For example, Netflix has a Web service out there, and it's on odata.Netflix.com/V2/catalog.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=199.296) [What this Web service will do is respond with, What can I get to in Netflix?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=208.386) [So if I send off that request, what I'll get back is XML, just like I requested.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=213.136) [It sends back a content type of application/XML.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=218.626) [And what we're looking at is the catalog, or the things I can get to inside of this Web service.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=221.886) [I can get to titles.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=227.156) [I can get to people.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=228.216) [I can get to the different languages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=229.396) [But now let me go back into Visual Studio and change this accept header ever so slightly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=232.296) [Instead of application/XML, I want application/json.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=237.526) [And I'll rebuild the program.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=242.626) [And now there's nothing in this URL, odata.Netflix.com,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=244.576) [that says I want a json representation, so I can use it from JavaScript.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=249.076) [That's part of the content negotiation that is in the request headers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=253.066) [So when we run the application, what I get back now is a content type of application/json.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=258.266) [This is something that's very easy to parse and consume from JavaScript.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=264.276) [I might use the XML, if I'm querying this from C# or C++ or Java.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=267.926) [But for some of the dynamic languages and languages that support json serialization](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=273.326) [and deserialization -- like JavaScript -- then json is a perfect choice.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=277.256) [Now, there's one more thing that a URL cannot do.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=281.696) [It cannot say what a user wants to do with a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=285.326) [A URL doesn't say if I want to retrieve a resource or edit a resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=288.816) [That's the job of the HTTP request message, to describe the intention of the user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=293.196) [And it does that using one of the HTTP standard methods.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=297.826) [And as we talked about in Part 2, there's a limited number of those methods.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=300.736) [The most popular ones are get and post, but there's also put and delete.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=304.556) [Now, when you start thinking about resources and URLs, as we are in this module,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=309.286) [you start to see the Web as part of your application, and it's a flexible,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=313.926) [architectural layer that you build on.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=317.486) [For more insight into that line of thinking,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=319.876) [see Roy Fielding's famous dissertation entitled {italic}Architectural Styles and the Design{plain}](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=322.016) [{italic}of Network-Based Software Architectures.{plain}](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=326.856) [That's the research paper that introduced the representational state transfer style](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=329.216) [of architecture.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=333.976) [And it goes into great detail about the ideas and concepts I'm talking about here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=334.936) [in this clip and in the next one.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=1&mode=live&start=339.186)

[Architectural Qualities](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live)

[So far, we've been focused on what a URL cannot do,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=1.566) [when we really should be focused on what a URL can do.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=4.856) [Or rather, I want to focus on what a URL plus HTTP can do,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=8.036) [because they work beautifully together.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=11.466) [In his dissertation, Fielding describes the benefits of embracing HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=13.486) [These benefits include scalability, simplicity, reliability, and loose coupling.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=17.156) [HTTP offers those benefits, because, in part, you can think of the URL as a pointer,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=23.196) [or a unit of indirection, between a client and a server application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=28.386) [Again, the URL itself, it doesn't dictate a specific resource representation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=32.246) [It doesn't dictate the technology implementation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=36.826) [It doesn't dictate the client's intention.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=39.836) [Instead, the client expresses the desired intention and representation in an HTTP message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=41.746) [An HTTP message is very simple.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=47.986) [It's plain text, as we've seen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=50.196) [The beauty of that is how both the request and the response are fully self-describing.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=52.166) [They're standardized.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=57.466) [They're easy to parse.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=58.436) [The request message includes the HTTP method, which describes what the client wants to do;](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=60.146) [the path to the resource; and additional headers that provide information](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=65.296) [about what representation that I want.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=69.226) [The response includes a status code to indicate the result of a transaction,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=72.246) [but also includes headers with cache instructions, the content type of the resource,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=75.796) [the length of the resource, and other valuable metadata.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=80.436) [Because all of the information required for this transaction is contained in these messages,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=84.376) [and because that information is visible and easy to parse, HTTP applications can rely on a number](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=89.986) [of services that provide value, as a message moves between the client and server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=2&mode=live&start=95.636)

[Adding Value](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live)

[As an HTTP message moves from the memory space of a process on one machine to the memory space](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=2.596) [of a process on another machine, it can move through several pieces of software and hardware](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=8.766) [that inspect and possibly modify that message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=13.616) [One good example is the Web server application itself.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=16.736) [A Web server, like IIS or Apache, will be one of the first recipients of an incoming HTTP message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=20.166) [on a server machine; and as a Web server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=25.646) [it's responsible for routing messages to the proper application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=28.166) [So here we had a Web server that was hosting three different sites,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=31.746) [using three different technologies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=35.016) [It received an incoming HTTP request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=36.876) [It needs to peek inside that message, look at a host header, and it can use that to figure](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=39.646) [out which application should receive and process that message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=44.246) [That's a fairly common scenario and something that's really easy](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=47.466) [to configure in IIS and Apache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=50.436) [But all these Web servers, they can also perform additional actions](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=52.676) [with the message, like logging to a local file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=56.216) [So as the Web server is sitting there and a message comes through, it can take that message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=59.476) [and record it in a log file, as many details as you want.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=63.716) [And likewise, when the application creates the HTTP response message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=66.536) [the server also has a chance to interact with that message on the way out.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=72.056) [That could be a simple logging operation,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=75.256) [but it could also be a direct modification of the message itself.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=77.756) [For example, a server knows that the client supports gzip compression,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=80.896) [because a client can advertise that fact through an accept encoding header in the HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=85.496) [What compression allows you to do is take a 100-kilobyte resource](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=91.656) [and turn it into a 25-kilobyte resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=95.376) [That means it's going to transmit much faster.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=98.016) [And you can configure many Web servers to automatically use compression](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=100.656) [for certain content types -- typically, text types.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=104.816) [And this happens without the application itself worrying about compression.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=107.976) [Compression is an added value provided by the Web server software itself.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=112.256) [The applications don't have to worry](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=116.366) [about logging the HTTP transactions or adding compression.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=118.636) [And that's all thanks to the self-descriptive messages that allow pieces of infrastructure](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=122.506) [to process and transform these HTTP messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=127.626) [This type of processing can also happen as the message moves across the network, too.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=3&mode=live&start=131.456)

[Proxies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live)

[These self-describing, visible HTTP messages allow us to use proxy servers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=2.096) [A proxy server is a server that sits between a client and a server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=7.716) [A proxy is mostly transparent to the end user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=12.106) [So you think you're sending a request directly to a server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=14.826) [but the HTTP request message is actually going to the proxy, which will take that message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=17.896) [and forward it to the server that you want it to get to.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=23.026) [It can also, then, wait on the response from the server and forward it back to the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=25.786) [But before forwarding either of those messages, the proxy can also inspect the message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=30.976) [and potentially take some initial actions.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=35.606) [For example, one of the clients I work for uses a proxy](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=37.706) [to capture all HTTP traffic leaving the office.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=41.196) [They don't want employees and contractors spending their time on Twitter and Facebook,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=44.376) [so HTTP requests to those servers will never reach their destinations,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=48.286) [and there's no tweeting or Farmville inside the office.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=51.976) [That's an example of one popular role for a proxy server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=54.506) [which is to function as an access control device.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=57.996) [But a proxy server can actually be much more sophisticated than just dropping messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=61.656) [that are trying to get to specific hosts.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=65.776) [Any firewall could do that.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=67.806) [A proxy server can also inspect messages, to remove confidential data,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=69.386) [like strip out the Referer header from HTTP messages, if that Referer points](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=73.566) [to an internal resource inside the company network.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=78.576) [An access control proxy can also log all the HTTP messages, create audit trails on traffic.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=81.096) [And many of these access control proxies require a user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=86.986) [to log in, before they can access the Web.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=89.956) [That's a topic we'll look at in the next module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=92.236) [The proxy I'm describing here is what we would categorize as a forward proxy.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=95.736) [A forward proxy is usually closer on the network to the client than it is to a server,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=100.666) [usually one or two network hops away from any particular client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=105.036) [And forward proxies usually require some configuration](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=108.606) [in the client software or Web browser to work.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=111.806) [The idea is that the forward proxy is providing some services, to benefit just the users](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=114.526) [in a particular location, not the Internet as a whole; so the users at a specific company](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=119.396) [or in a specific office building, or the customers of a single Internet service provider.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=124.736) [Another category of proxy servers is the reverse proxy.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=129.486) [A reverse proxy is a proxy server that's usually closer to a server than it is to the client,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=133.916) [and these are usually completely transparent to the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=139.046) [A reverse proxy exists to provide some benefit to a specific website,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=142.146) [and it can indirectly benefit all the users on the Internet, because all the requests coming](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=146.246) [to servers for that website are coming through the reverse proxy.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=151.786) [Now, both these types of proxies -- forward proxies and reverse proxies --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=155.716) [they can provide a wide range of services.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=158.956) [For example, if we return to that gzip compression scenario we talked about earlier,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=161.166) [a proxy server has the capability to compress response message bodies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=165.896) [A company might use a proxy server for compression, to take some of the load off](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=170.256) [of the server where the application actually lives.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=173.696) [Now, neither the application or the Web server software itself has to worry about compression.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=176.366) [Instead, it's a feature that's layered in, via a proxy server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=181.386) [That's the beauty of HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=4&mode=live&start=184.926)

[Proxy Services](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live)

[Proxies can perform a wide range of services.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=1.306) [For example, load balancing.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=3.996) [This is where a proxy takes incoming messages and distributes them to one](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=6.106) [of several Web servers on a round-robin basis,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=10.006) [or by knowing which server is currently processing the fewest number of requests.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=13.096) [For example, the proxy server here at the foodchopper.com might take a request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=17.076) [from the Internet and send it to Web2.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=21.186) [Then when the next request arrives, since the previous request went to Web2 for processing,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=23.546) [it might send this request to Web1,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=28.706) [in hopes that the load will stay even across those servers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=30.136) [Some proxies and load balancers can even look at the servers to see how much CPU](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=34.526) [and memory they're using and route messages to the servers with more resource headroom.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=38.956) [A proxy server can also direct requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=44.256) [to different servers, depending on the content types.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=46.206) [For example, a company might put all their images and static assets on a server optimized](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=49.166) [for serving those types of assets.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=54.076) [And all dynamically-generated content on servers optimized for PHP or ASP.NET or RubyOnRails,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=55.886) [that's another common proxy operation.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=63.276) [The proxy server can make sure that those requests get directed to the right server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=65.536) [There's also proxy servers that implement SSL acceleration.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=69.526) [This is where the proxy server actually does the encryption and decryption of HTTP messages,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=73.866) [taking that load off of the Web servers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=78.716) [We'll talk more about SSL in the next clip.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=81.126) [Proxies can also add an additional layer of security,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=84.056) [by filtering out potentially dangerous HTTP messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=86.866) [Specifically, some proxies can look for messages that might have cross-site scripting attacks](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=90.366) [or SQL injection attacks embedded inside of them.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=95.766) [And finally, caching proxies will store copies of frequently-accessed resources and respond](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=98.316) [to messages requesting those resources directly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=104.986) [That typically improves performance.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=107.736) [We'll go into more detail about caching in the next clip.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=109.796) [But before we leave here, I just want to point](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=113.426) [out that proxies do not have to be a piece of hardware.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=115.066) [For example, the tool we were using previously, Fiddler, it has the ability](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=118.926) [to intercept HTTP requests, and it will do that by installing itself as a proxy on the machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=123.726) [So here you can see it is picking up requests to Google.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=130.546) [And the way it does that, you can see it, if you go to the right location,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=133.696) [to see how the proxy server is configured in Internet Explorer.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=137.666) [And I'll just warn you that you might want to bring out a pencil to write this down,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=141.106) [because it's under Tools, Internet Options.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=144.256) [You have to go to Connections, click on LAN Settings, and then go to the Advanced section.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=147.576) [So what happens, when you launch Fiddler, is it goes in to Windows and figures things](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=154.996) [in such a way that all HTTP traffic will need to go through this proxy, 127.0.0.1.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=159.386) [That turns out to be the loopback IP address, which is essentially the address](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=166.626) [of this machine that's local host.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=171.386) [So all the outgoing HTTP requests are going to my machine on port 8888.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=174.506) [That's where Fiddler will sit and listen for an incoming HTTP request, log it,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=180.756) [and pass it along to the server, wait for the response, log the response,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=186.166) [and pass that back here to Internet Explorer or Chrome, or any other Web browser on the system.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=190.186) [Once we close all this and we close Fiddler,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=196.626) [you'll notice that suddenly the proxy connection goes away.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=5&mode=live&start=200.746)

[Caching](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live)

[We talked about proxy servers possibly caching information.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=1.956) [Caching is an optimization, to improve performance and scalability.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=5.806) [When there are multiple requests for the same resource representation,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=9.576) [a server can send the bytes over the network time and time again, for each request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=13.406) [Or a proxy server or a client can cache the representation locally and reduce the amount](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=17.976) [of time and bandwidth required for a full retrieval.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=23.446) [Caching can help reduce latency, help prevent bottlenecks, and allow a Web application](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=26.186) [to survive, when every user shows up at once](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=31.636) [to buy the newest product or see the latest press release.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=34.366) [Caching is also a great example of how the metadata](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=37.096) [in an HTTP message facilitates additional layers and services.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=40.936) [The first thing to know is that there are two types of caches.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=46.606) [A public cache is a cache shared among multiple users.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=49.476) [A public cache generally resides on a proxy server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=53.606) [A public cache on a forward proxy is usually caching the resources that are popular](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=56.726) [in a community of users, like the users from a specific company,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=61.586) [or the uses of a specific Internet service provider.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=65.506) [A public cache on a reverse proxy is generally caching the resources that are popular](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=68.806) [on a specific website, like popular product images from Amazon.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=73.676) [Those are public caches.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=78.426) [A private cache is dedicated to a single user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=79.976) [Web browsers always keep a private cache of resources on your disk.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=83.246) [These are the temporary Internet files in Internet Explorer, or type about:cache](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=87.176) [in the address bar of Google Chrome, to see the files in its private cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=92.546) [Anything a browser has cached on the file system can appear almost instantly on the screen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=96.316) [The browser doesn't even have to send off a request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=101.036) [The rules about what to cache, when to cache, and when to invalidate the cache --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=104.936) [that is, kick an item out of the cache, because it's no longer fresh or up-to-date --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=108.796) [they are a little bit complicated and mired by some legacy headers and behaviors.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=113.356) [But allow me to point out some of the things that you should know.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=117.426) [First of all, with HTTP 1.1, clients and proxies generally want to cache a response](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=120.406) [that has a 200 okay status code and that is the response to an HTTP get request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=125.626) [Remember, we talked about safe and unsafe methods](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=132.026) [in an earlier module, and get is a safe method.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=134.436) [It's not supposed to change state on the server, and we can send off as many get requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=137.356) [as we like, without messing up the application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=141.146) [Put, post, and delete are considered unsafe,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=143.816) [because we use them to change state on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=146.096) [We use a post request to submit a credit card transaction, change a profile, log in to a site.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=148.866) [Most everyone will avoid caching these types of requests, because bad things can happen.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=153.796) [I thought I ordered the 20-piece knife set with the bonus woodcutting board,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=158.566) [but it turns out I had a cached response, and the transaction didn't really go through.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=162.436) [Now, an application or server can influence the cache settings](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=166.066) [by using the proper HTTP headers and a response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=169.836) [In HTTP 1.1, this header is the cache control header,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=173.666) [although you can also see an expires header in many messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=177.626) [The expires header is still around and widely supported, despite being deprecated in HTTP 1.1.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=181.006) [Pragma is another example of a header commonly used to control caching behavior, but it, too,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=186.536) [is really only around for backward compatibility.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=191.576) [So we are going to focus in on cache control.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=195.166) [An HTTP response can have a value for cache control of public, private, or no cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=197.776) [A value of public means public proxy servers can cache the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=204.256) [This response is for anyone.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=207.746) [A value of private means the response is really targeted to a single user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=209.756) [So only private caches should keep those; that is, caches in the Web browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=214.686) [And of course, no cache is telling everyone in the world](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=219.006) [that they shouldn't cache this response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=221.366) [There's also a no store value, meaning the message might contain some sensitive information](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=223.186) [and it shouldn't be persisted at all.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=228.286) [It should be removed from memory as soon as possible.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=229.826) [Now that you know this, how would you use this type of information?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=232.696) [Well, for popular requests for shared resources, like a homepage logo,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=235.696) [you might want to use a public cache control directive,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=240.646) [to allow everyone to cache the image, even proxy servers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=243.036) [For requests that are going to a specific user, like the HTML for the home page](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=246.376) [and that HTML include to the user's name, you want to use a private cache directive.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=251.086) [You don't want other users to have the wrong user name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=255.816) [In ASP.NET, you can control these settings via response.cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=258.396) [So there's response.cache.setcachability.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=263.486) [Set it to public or private or no cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=266.536) [And there's also an expiration that you can set, because once an item goes into the cache,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=268.996) [it may not want to live there forever.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=274.896) [You might just want to cache something for 10 seconds,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=277.356) [because information changes every 10 seconds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=279.586) [Or you might want to cache it for 10 years, because it's an image](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=283.106) [and you don't expect it to change.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=285.896) [Here is an HTTP response for an image, and you can see it's using a cache control of private,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=288.916) [and the expiration is set by the max age value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=294.756) [Max age is specified in seconds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=298.196) [This particular cache control setting is saying](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=300.996) [that this is good for at least 31 million seconds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=303.076) [That would be about 10 years.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=305.776) [And notice there's another header here, Last-Modified.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=307.256) [The browser can use that piece of information as a validator.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=312.046) [That is, how can I validate that this thing I have in the cache is still good.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=315.396) [Well, it could go to the server and request that image again and say, Hey,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=319.766) [here's the last date that I have for the image.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=323.216) [Has it changed since then?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=325.226) [And if it has changed, the server can send the new image.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=326.616) [If it hasn't changed, the server can send a special response that we looked at earlier,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=330.066) [the 304 response that says this content wasn't modified.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=334.416) [What you have in the cache is good.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=338.906) [Let's actually go out and use Fiddler and see some of these requests and response headers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=6&mode=live&start=340.426)

[Fiddling with the Cache](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live)

[Here I have Fiddler running in the background and capturing HTTP requests and responses.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=3.236) [I have Internet Explorer open.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=8.126) [I'm just going to press F12, to go into the Internet Explorer developer tools,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=9.926) [and I'm going to use them to clear the browser cache entirely.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=14.126) [Sometimes you need to restart the browser after doing that,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=18.126) [but at this point the browser shouldn't have any resources that it has cached locally.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=20.576) [And now that that's set up, we will go to MSDN.Microsoft.com and take a look at some](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=24.896) [of the requests and responses that we got.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=31.746) [So first off, here is the homepage for MSDN.Microsoft.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=34.466) [You can see that the cache control for this response for this resource is private,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=39.036) [so it's tailored for a specific individual -- that would be me --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=43.406) [and the person that made the request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=46.826) [I also want to point out that the response was compressed.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=48.946) [I know that, because the content encoding is set to gzip.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=52.096) [I also know that, because Fiddler will tell me the response was encoded.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=55.396) [And if I click here, it will actually decompress and decode the response,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=58.586) [so I can look at the HTML and everything that Microsoft.com sent back to me.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=63.246) [And let's look at a later request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=67.886) [Something in that home page had a link or pointed to another resource rad.MSN.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=70.986) [I'm assuming that this is some sort of advertisement,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=77.476) [some sort of script that will bring up an ad.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=79.996) [Notice that the cache control is set to no cache, must revalidate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=82.256) [That's being very explicit and saying, please do not cache this resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=85.896) [If my server is serving up scripts that put ads on a page, then I want to know every time](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=90.266) [that the browser is hitting that page and requesting that script.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=95.766) [I don't want the browser to just use a cached version of it,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=98.696) [because when they actually make the request, that's something that counts as a hit](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=101.616) [for that advertisement, so I can earn, like, a quarter of a quarter of a quarter of one penny.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=104.776) [There's also a Pragma header -- a Pragma header that says no cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=111.066) [This is part of what makes caching confusing in HTTP,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=115.076) [is that there's so many different headers from different periods in time.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=118.026) [Pragma is a very old header that's been around forever,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=122.246) [but this is basically just the server trying to be as interoperable as possible,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=125.016) [trying to express this to many people as possible,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=128.996) [that this response is not supposed to be cached.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=131.576) [It also has an Expires header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=135.046) [That Expires header is set way back in time -- January, 1990 --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=136.816) [so everyone should be able to see that, well,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=141.206) [this request that we got, it's already out of date.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=143.406) [The next time we need it, we'll have to make another request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=146.536) [And let's look at a later request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=148.826) [This one is for some sort of JavaScript resource,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=152.266) [because the accept type says it once, application/JavaScript.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=155.036) [And the content type that was received was application/x-javascript.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=158.406) [Notice the cache control here is public.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=162.756) [So, whereas the home page was tailored for a specific user,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=165.826) [this JavaScript file is the same for everyone.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=169.586) [So it's okay if a proxy server wants to cache this JavaScript file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=172.456) [It's not going to change for 7,200 seconds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=176.106) [Notice there's a validator here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=179.696) [That's the Last-Modified header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=181.026) [It says that this file hasn't changed since January 23rd, 2012.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=182.876) [And there's another validator here that we haven't talked about.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=187.566) [That's the ETag.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=190.576) [So an ETag is an opaque number.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=192.146) [There's no way you can look at that number and deduce](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=194.206) [when the file was last modified, or anything like that.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=196.956) [ETags are commonly generated by doing a hash of the resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=199.836) [So they're really just a number that can be used for comparison.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=204.086) [So in other words, if I want to find out if this resource has changed or not,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=207.356) [I could go to the server and say, Hey, do you still have the JavaScript file.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=210.366) [By the way, the last ETag that I had for this was this value, 07F2,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=214.106) [etc. And the server can look at that ETag, compare it to the current ETag --](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=219.276) [it's a really easy comparison -- and say, yes it changed, or no, it didn't change.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=223.656) [So, use the result that you already have cached.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=227.746) [Now, if we go back into Internet Explorer and I do a refresh,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=230.586) [then what we'll start to see are some 304 responses.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=235.656) [So let me see if I can find the JS file that it requested.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=239.406) [So here's -- here on this page refresh is an outgoing request for that JavaScript file again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=243.836) [And perhaps we didn't get the exact same JavaScript file,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=249.416) [because the If-Modified-Since is different.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=253.296) [But basically, here's a request that goes out to the server that says, I need broker.JS.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=255.606) [And by the way, I only need it if it's been modified since September 14th, 2011.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=260.686) [And where does it get September 14th, 2011?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=267.056) [It that got that from the last modified header, on some previous request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=270.126) [It also sends up an If-None-Match ETag.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=275.686) [So again, multiple headers, multiple validates.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=279.136) [It's all to be as interoperable as possible.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=281.176) [The implementation is going to pick one of those two to match against.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=283.736) [And the response, in this case, comes back and says, 304 not modified.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=286.946) [You have the latest version.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=292.306) [Go ahead and serve it up from script.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=293.686) [By the way, the last modified date is still 14th of September 2011.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=295.466) [The ETag is still 099C9 something.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=300.346) [This can still be cached publicly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=303.886) [And don't worry about it expiring for at least another 7200 seconds.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=306.146) [Now, in this case, if that was, let's say, a 20-kilobyte JavaScript file,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=312.306) [then we just saved 20 kilobytes of bandwidth,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=316.366) [by not having to transmit the entire file back to the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=318.636) [And then it's up to the user agent to determine, if I refresh again,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=321.626) [whether it needs to send off the request for that JavaScript file again and get a 304,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=326.116) [or if it's just going to serve something directly from the local cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=330.306) [Every user agent has different rules and heuristics that it uses.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=333.236) [But they pretty much all try to stick by the standards.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=337.176) [When things say that something should be cached for this long,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=339.496) [they're not going to try to extend the cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=7&mode=live&start=342.336)

[Summary](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live)

[In this module, we talked about some of the hardware and network infrastructure involved](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=2.186) [in making HTTP work; and also how caching headers, client servers](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=5.636) [and proxies make it all work together, to make the Web reliable and scalable,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=9.796) [scalable to the point where websites can support millions of users a day.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=13.826) [Again, I'll come back to the point that all](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=18.026) [of this is made possible by the HTTP messages and URLs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=19.616) [On one hand, these messages, they contain a tremendous amount of information.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=23.336) [They are self-describing.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=27.466) [They describe the intent of the operation, what representation of a resource is desired,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=29.126) [how long to cache the response, when a resource last changed,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=34.156) [and what type of content is being transferred.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=37.386) [All of that information allows proxies and server software to add value](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=40.006) [to the Web in a transparent fashion.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=43.976) [There's an enormous number of details that I don't have to worry about,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=45.976) [as an application or Web service developer.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=49.346) [On the other hand, the messages in URLs are defined to not contain information](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=52.106) [that limits the benefits of the Web.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=55.956) [There's nothing that requires me to work in a specific language or technology.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=58.056) [There's nothing that requires me to have a certain type](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=61.896) [of file system or layout of files on the disc.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=63.986) [This is the loosely-coupled, flexible architecture that we always want](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=67.006) [in an application, and it's all made possible by HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m4-architecture&clip=8&mode=live&start=70.416)

[HTTP Security](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live)

[Hi, this is Scott Allen and in this last module we're going to look](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=0.056) [at security related topics like using cookies to identify users and manage state,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=5.056) [we'll look at some common Web authentication protocols](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=10.296) [and also the HTTPs protocol which is secure HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=13.146) [I want to start by looking at cookies to see how they help us manage state](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=17.396) [in the stateless hypertext transfer protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=21.106) [( pause )](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=0&mode=live&start=24.516)

[The Stateful Stateless Web](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live)

[HTTP is designed as a stateless protocol meaning each request response transaction is independent](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=2.576) [of any previous or future transaction.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=8.456) [There's nothing in the protocol that requires a server to retain state](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=11.056) [or information about a single HTTP request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=14.606) [All the server needs to do is generate a response for that request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=18.016) [and every request carry's all the information a server needs to create the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=21.826) [This stateless nature is one of the reason's that the Web is so successful](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=26.966) [because it allows us to build those layered services and add those services,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=31.656) [the ones that we looked at in the last module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=35.576) [Those are the services like caching, those are all made possible or at least easier](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=38.056) [because every message is self descriptive](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=42.456) [and contains all the information required to process that message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=44.666) [Proxy servers and Web servers can inspect, transform and cache those messages.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=48.346) [And without caching the Web couldn't scale to meet the demands of the internet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=52.646) [So while HTTP is stateless most of the applications that we build](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=58.606) [on top of HTTP are highly stateful.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=62.826) [For example, a banking application will want to make sure that a user logs](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=65.846) [in before allowing them to view their account related resources.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=70.156) [So every time one of these stateless requests arrives at the banking Website,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=74.256) [the application needs to know a little bit about the user needs to know](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=78.616) [that they've already authenticated and if they haven't it needs to send them to a login page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=81.956) [Another example of a stateful application is when the user wants to open an account](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=87.316) [and they need to fill out a four step wizard.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=91.096) [The application wants to make sure that the user completed the first step](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=93.056) [of the wizard successfully before allowing them to get to the second step.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=96.616) [Those are going to be independent HTTP transaction but the server needs to know](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=100.826) [about the state of where the user is inside of that four step wizard.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=105.086) [Fortunately there's many options for storing state in a Web application.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=110.376) [One approach is to embed state in the resources that are being transferred to the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=114.266) [so that the state required by the application or at least some](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=118.766) [of that state will travel back on the next request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=122.036) [That approach typically requires some hidden input fields and it works the best](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=124.566) [for short lived state like tracking the state as you move through a four step wizard.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=128.646) [Now if you've used asp.net Web forms you've taken advantage of an approach like this](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=133.416) [because Web forms has viewstate, that's literally the state](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=137.786) [of the form when it leaves the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=141.046) [The state of all the controls on that form get serialized into a single value that gets placed](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=143.276) [into a hidden input named viewstate and when the user interacts with the page](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=148.766) [and clicks a button, the viewstate is included in the post to the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=153.416) [which can recreate the Web form just like it was when it last left the server by deserializing](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=157.906) [that value and then it can apply new changes or data bind some updated data.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=162.746) [Embedding state in the resource is essentially maintaining or keeping state inside](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=167.086) [of HTTP messages and in general that's a very highly scalable approach to the Web](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=172.466) [to maintaining state but it can complicate application programming.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=177.516) [Another option is to store the state on the server or behind the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=182.786) [and that style is required for state that has to be around a long time.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=186.546) [So when the user submits a form to change their email address,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=190.046) [the email address must always be associated with the user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=193.216) [so that application can take the address, validate it and sort into a database or a file](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=196.096) [or call a Web service to let someone else take care of persisting the address.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=201.106) [For server session storage many Web development frameworks](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=206.486) [like asp.net also provide access to a user session.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=208.836) [The session may live in memory or it may live in a database but a developer can store information](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=213.246) [in the session and retrieve that information on every subsequent request from a particular user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=218.166) [Data stored in the session is scoped to an individual user,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=223.926) [actually to that user's browsing session, and it's not shared among multiple users.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=227.356) [Session storage usually has a very easy programming model and it's only good](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=232.866) [for short lived state because eventually the server has to assume that the user left the site](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=236.946) [or closed the browser and the server will discard that information.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=240.926) [In session storage if it's kept in memory it can have some impacts on scalability](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=244.976) [because subsequent requests must go the exact same server where the session data resides.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=250.346) [So if you're in a Web form where you have multiple Web servers,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=255.866) [multiple machines that are actually serving the resources for one single Website,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=259.656) [you have to make sure that the request always end up at the same machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=264.146) [Some load balancers help to support that scenario](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=268.506) [by implementing what we call sticky sessions.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=271.106) [I'll show you an example of session state in just a bit but you might already be wondering,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=273.046) [how can a server track a user to implement session state?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=278.876) [If multiple requests arrive at a server how does the server know if these requests are](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=282.906) [from the same user or two different users or multiple users?](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=287.026) [In the early days of the Web, Web server software might have differentiated users](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=291.116) [by looking at the IP address of request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=294.776) [These days however, many users live behind devices using network address translation,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=298.276) [and for that reason and various other reasons you can multiple users effectively](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=303.426) [on the same IP address and IP addresses can change.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=307.576) [So an IP address is not a reliable technique for differentiating users.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=310.946) [Fortunately there are more reliable techniques and they rely on cookies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=1&mode=live&start=315.696)

[Cookies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live)

[Websites that want to track users often turn to cookies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=1.476) [Cookies are defined by RFC 6265 and this RFC has the stimulating title](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=5.456) [of HTTP State Management Mechanism.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=11.186) [This document describes how a Website can give the user's browser a cookie using an](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=14.036) [HTTP header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=18.046) [The browser then knows how to send that cookie and the headers](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=19.406) [of every additional request that it sends to a site.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=21.996) [So assuming a Website has placed some sort of unique identifying into the cookie,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=25.226) [then the Website can now track a user as they make requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=29.416) [and differentiate one user from another.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=32.616) [Before we get into the details of what cookies look like and how they behave,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=35.546) [it's worth noting a couple limitations.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=39.206) [First, cookies can identify users in the sense that your cookie is different then my cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=41.646) [But cookies by themselves do not authenticate users.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=47.386) [An authenticated user has proven their identity usually](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=50.516) [by providing credentials like a user name and password.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=53.876) [The Cookies we're going to look at first just give us some unique identifier](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=56.956) [to differentiate one user from another and track a user as they make request to a site.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=60.456) [Secondly, they do raise some privacy concerns in some circles.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=65.746) [Some users will disable cookies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=70.366) [in their browsers meaning the browser will reject any cookies that a server gives them.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=72.106) [And disabled cookies present a problem for sites that need to track users of course](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=76.466) [and the alternatives are a little bit messy.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=80.836) [For example, one approach to a cookieless session is to place some sort of user identifier](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=83.846) [into the URL, meaning each and every URL that a site gives](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=89.306) [to a user must contain the proper identifier and the URLs become much larger.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=93.326) [That's why we often call this technique the fat URL technique.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=98.216) [When a Website wants to give a user a cookie, it uses a set cookie header in an HTTP response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=102.536) [So here's an incoming request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=108.476) [to searchengine.com, someone is searching for lyrics.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=110.196) [Searchengine.com wants to track users so in the HTTP response to that message,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=113.176) [it's going to have a set cookie header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=119.046) [There are three pieces of information in this particular cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=121.686) [The three pieces are delimited by semi colons.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=124.746) [First there's a collection of name value pairs](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=127.336) [and these name value pairs themselves are delimited by a dollar sign.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=129.706) [That's very similar to how query parameters are formatted into a URL,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=133.726) [we looked at that in the first module.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=137.726) [In this example the server must want](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=139.756) [to store the user's first name and last name in the cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=141.266) [The second and third pieces of information are the domain and the path,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=144.536) [we'll circle back around and talk about those a little bit later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=148.536) [Now a Website can put any information that it wants into a cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=151.856) [but many Websites will only put a unique identifier, perhaps a Guid.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=155.406) [And there's a couple reasons for this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=160.086) [One is, there is a size limitation in cookies of around four kilobytes and secondly,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=161.876) [a server can never really trust anything that it stores](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=166.876) [on the client unless it's cryptographically secured.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=169.436) [So while it is possible to store encrypted data in a cookie,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=172.616) [it's usually just easier to store an ID.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=175.836) [Assuming the browser is configured to accept cookies then the browser will take that cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=178.746) [and it's going to send it along in any subsequent request it that it makes](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=183.546) [to searchengine.com that GUID will be there.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=187.136) [And when the ID arrives at the server, the server can use that to look](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=189.546) [up the associated data for that user from an in memory data structure](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=193.436) [or from a database or from a distributed cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=197.526) [You can configure most Web application frameworks to manipulate cookies automatically](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=200.546) [and look up session state for you.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=204.586) [Let's take a look at an example of how this works.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=2&mode=live&start=206.276)

[Tracing Sessions and HttpOnly](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live)

[Back in the module where we talking about HTTP messages, I wrote a little application](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=1.736) [that would allow a user to sign up for our Website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=6.956) [We weren't really doing a sign up, we were letting the user enter their first name,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=9.666) [enter their last name, click a submit button and when the resulting post request came](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=13.226) [into the server we were just going to save the first name and last name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=18.106) [into this session data structure and then redirect the user to another page,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=21.346) [signedup.cshtml where I was going to prove that we actually did save information in the session](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=25.986) [so we would write out first name and last name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=32.296) [And that was just intended to simulate some sort of data access.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=34.456) [We'd probably save the first name and last name into the database but we'd still need a way](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=38.116) [to lookup the user's information, we'd still need a way to identify their session and that's](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=42.506) [where this session object is useful and it's implemented with cookies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=47.236) [So while Fiddler is running in the background to trace the request, let's actually go in to](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=51.036) [that form and I'll fill out my name, Scott Allen, click submit and we end up here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=56.216) [on signedup.cshtml where it successfully retrieved my first name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=63.516) [and last name from the session object.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=67.456) [Let's go into Fiddler and take a look at the actual request that were sent.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=69.846) [This was the initial get request to the server, give me the form where I can sign up,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=75.536) [the response didn't include any special headers here because we weren't using a session as yet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=80.306) [Asp.net will create the session on a lazy basis.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=85.576) [Other Web frameworks might do the same or they might do it eagerly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=89.516) [Everyone's a little bit different but the programming api](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=92.646) [and the implementation is usually pretty similar.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=94.576) [Here is the post request where I clicked the submit button, the browser sent up a request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=98.816) [to post request that included my first name and last name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=103.806) [in the HTTP body, we've seen that before.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=106.556) [And here's the response that came back.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=109.096) [It was the redirect that we expected in HTTP 302 and here's the set cookie header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=110.816) [Asp.net underscore session ID equals some big jumblation of characters.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=116.216) [Now there's several observations that I want to make about that particular header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=123.246) [but before I do I just want to show you the next request which was, the browser said oh,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=126.876) [I wasn't supposed to go here, I was supposed to go to signedup.cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=131.206) [And if we look in that get request you'll see that the browser sent up the cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=135.596) [with asp.net underscore session ID that is unique to me.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=140.646) [If someone else browses the Website they'll get a different session ID](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=145.126) [and that's how the server can now differentiate user's and look up the proper session state.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=148.306) [One other piece that I want to point out is that if I go to a different browser](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=153.916) [and this time I'll go to Internet Explorer and if we try to go to the same page,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=158.526) [signedup.cshtml, it doesn't know my name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=164.616) [And this is because cookies get set in a browser and yes they are per user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=169.686) [but if the user is using different browsers](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=176.536) [or has cookies disabled that can sort of mess things up.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=178.896) [So, there was a cookie that was set in Chrome, there was no Cookie set in IE as](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=182.026) [yet because I didn't go through signup.cshtml as yet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=186.496) [But let's go back and look at this set cookie header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=191.116) [So first of all I want to point out that first name and last name,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=194.936) [that was not data that was stored in the Cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=198.046) [Instead the only thing stored in the cookie is some sort of session identifier.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=201.156) [First name and last name are stored by default with asp.net in memory on the Web server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=205.166) [The Web server's just using this cookie value to look up the proper data structure in memory.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=210.976) [Secondly, we might look at this ID, u3ylzcntnrr, etc. and wonder why it's so complicated.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=216.046) [Well one security concern around session identifiers is how they can open](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=224.026) [up the possibility of someone high jacking some other user's session.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=227.396) [So for example, here we are in Fiddler and I can see my asp.net session ID and imagine](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=232.126) [if my session ID was something like asp.net underscore session ID equals 12.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=237.286) [Well then I might take a guess that asp.net is just incrementing some sort of session ID](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=242.846) [so there's one, two, three and four and I might guess](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=248.046) [that some other user already has a session ID of 11.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=251.066) [Knowing that information I could construct an HTTP request message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=254.326) [with an asp.net session ID equals to 11 and just see if I could steal or view that html intended](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=258.496) [for some other user, find out some other user's name or account number.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=264.496) [To combat that problem most application frameworks use large random numbers](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=267.726) [as identifiers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=272.296) [Asp.net uses 120 bits of randomness and stores it into this string of characters.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=273.326) [This just makes it more difficult to guess what someone else's session ID would look like.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=279.726) [And note that that still doesn't prevent someone who might be sniffing traffic on my network,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=283.876) [picking up my session identifier and using it to high jack my session.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=289.386) [The only way to prevent that is to use secure HTTP which we'll talk about in just a bit.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=294.196) [The other piece that I wanted to talk about in this set cookie header,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=299.036) [first of all there's no domain, we'll talk about what the default domain setting is.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=302.256) [I want to point out the HTTPOnly flag here because another security concern](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=306.556) [around cookies is that they are vulnerable to a cross site scripting attack.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=311.106) [In a cross site scripting attack a malicious user injects Java script code](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=315.156) [into someone else's Website and if the other Website sends that malicious script](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=319.386) [to their users, a script has the ability to modify and inspect and steal cookie information.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=324.296) [So a malicious script could find my asp.net session ID and perhaps use an Ajax request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=330.966) [to send it off to some other server where someone's recording these things](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=336.636) [and then they know my session ID.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=339.926) [To stop that sort of problem it was actually Microsoft](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=341.216) [that introduced this HTTPOnly flag and it's now a standard.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=344.956) [And what the HTTPOnly flag tells the browser, the user agent,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=348.136) [is that it should not allow script code to access this cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=352.496) [This cookie exists only to put into HTTP request and travel](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=356.696) [in the header of every HTTP request message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=361.456) [So browsers that correctly implement HTTPOnly, and most of them do these days,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=364.216) [will not clients like Javascript to read or write this cookie on the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=368.986) [And that is a very good thing because cross site scripting attacks are very popular these days.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=3&mode=live&start=373.746)

[Cookie Paths, Domains, and Persistence](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live)

[So far all the cookies we've looked at are what we would call session cookies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=2.356) [Don't confuse that with the session object or session data on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=6.206) [It's a specific type of cookie that we call a session cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=10.296) [because it exists for only a single user session.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=12.966) [It's get destroyed when the user closes their browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=16.366) [So in this example we've gone to searchengine.com and it used a set cookie header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=19.756) [to give the browser a cookie with a GUID value inside of it and every subsequent request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=24.136) [that the browser makes to searchengine.com it's going to pass along that GUID value](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=28.506) [until the user closes their browser and then the browser simply forgets about that cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=32.676) [A persistent cookie is the other type of cookie and it can outlive a single browsing session](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=38.196) [because the browser, the user agent, will typically store](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=43.506) [that cookie to the file system to disc.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=46.546) [So I can shut down a computer and come back one week later, go to my favorite Website](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=49.026) [and a persistent cookie would still be around for the first request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=52.996) [The only difference between the two is that a persistent cookie needs an expires value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=57.386) [So what we're looking at right here, I know it's a session cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=61.996) [because there is no expires value in the cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=64.696) [However, this cookie is a cookie that has an expires value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=67.916) [This cookie is going to be around until July 9, 2012.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=72.106) [The next piece that I want to talk about is this domain value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=77.516) [I've said that once a cookie is set by a Website, the cookie travels](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=80.456) [to that Website with every request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=83.866) [However, not all cookies travel to every Website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=86.736) [The only cookies a user agent should send to a site are the cookies that the site gave it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=91.346) [It wouldn't make sense for cookies from Amazon.com to be an HTTP request to Google.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=95.856) [That type of behavior would only open up additional security and privacy concerns](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=102.356) [and Google.com really shouldn't understand what's inside of Amazon.com's cookies anyway.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=106.856) [So if you set a cookie in a response](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=112.026) [to www.searchengine.com the resulting cookie should only travel](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=114.406) [in requests to www.searchengine.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=120.456) [A Web application can change that a little bit and restrict the cookie to a specific host](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=124.206) [or domain or even to a specific resource path by using this domain and this path attribute.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=129.176) [The domain attribute basically allows a cookie to span sub-domains.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=135.506) [In other words, if you set a cookie from www.searchengine.com the browser's only going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=140.086) [to deliver that cookie to www.searchengine.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=146.486) [But if I set a cookie and I say that the domain is dot searchengine.com that allows the cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=150.916) [to travel to any URL in the searchengine.com domain.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=156.716) [That would include images dot searchengine.com and help dot searchenginel.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=160.836) [So you cannot use this domain attribute to span domains, in other words,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=166.776) [if the browser makes a request to searchengine.com and it tries to set a cookie](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=170.836) [with a domain set to Microsoft.com that's not legal, the user agent should reject the cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=175.226) [But if I go to www.searchengine.com it will be allowed to set the cookie domain](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=181.776) [to dot searchengine.com which is essentially telling the browser don't just send this](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=186.376) [to the www server, send it to anything that ends with dot searchengine.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=191.136) [The path attribute, that's another way to restrict a cookie to a specific resource path.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=196.106) [So in this example the cookie will travel to basically anything under dot searchengine.com](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=202.186) [but if we sent that path to something like slash stuff or slash images,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=207.616) [that would be telling the browser only send this cookie to something on searchengine.com](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=212.336) [when the URL path starts with slash stuff or slash images.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=217.606) [Path settings can help you to organize cookies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=221.456) [when there's multiple teams building Web applications in different paths.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=4&mode=live&start=224.906)

[Basic and Digest Authentication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live)

[Cookies are good for tracking and differentiating one user from another user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=1.696) [but sometimes we need to know an individual user's identity.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=6.056) [We need to know exactly who they are.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=9.546) [A process of authentication forces a user to prove their identity by entering a user name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=12.106) [and a password or an email and a pin or some other type of credentials.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=17.176) [With the Web, authentication follows a challenge response format.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=21.806) [A client will request a secure resource from the server and the server will challenge the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=25.576) [to authenticate by sending back an HTTP response with a challenge inside of it.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=31.146) [The client then needs to send another request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=35.546) [and include authentication credentials for the server to validate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=37.816) [If the credentials are good that request will succeed.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=41.426) [The extendability of HTTP allows HTTP to support various different authentication protocols.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=45.406) [In this module I'm going to briefly look at the top five which include, basic authentication,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=51.436) [digest, Windows, forms and open ID.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=56.256) [Of these five, only two are official in the HTTP specification,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=59.346) [the basic and digest authentication protocols and we'll first talk about basic authentication.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=63.366) [With basic authentication the client requests a resource with a normal HTTP message](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=68.876) [and the Web server, most of them will let you configure access](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=74.066) [to specific files and directories.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=78.136) [You can allow access to all anonymous users or restrict access to the only specific users](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=79.986) [or groups can access a particular file or directory.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=85.256) [For this request, imagine the server's configured to only allow users](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=89.106) [that have authenticated themselves to view a slash account resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=92.886) [In this case the server then has taken that anonymous request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=97.236) [and returned a challenge saying I need to authenticate,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=100.826) [the authentication protocol is the basic authentication protocol](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=104.746) [and notice the 41 status code, that is telling the client the request is unauthorized.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=108.486) [A www dash authenticate header tells the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=114.226) [to collect the user credentials and then try this again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=117.226) [The basic realm attribute, that gives the user agent a techtual description](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=120.296) [of the protected area.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=125.526) [And what happens next depends on the specific browser but most browsers will open](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=126.856) [up a dialogue that allows the user to enter their user name and password.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=131.756) [We'll look at that in just a second.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=136.096) [But once that happens the browser can send another request to the server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=137.976) [and this request will include an authorization header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=141.636) [And the value of the authorization header is the client's user name and password](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=144.696) [and with basic authentication the user name and password is just base 64 encoded.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=148.946) [That means basic authentication is insecure because anyone who can view](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=154.606) [that message can find out the user's name and password.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=159.426) [So for that reason basic authentication is rarely used](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=163.776) [without secure HTTP which we'll look at later.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=166.786) [But at this point it's up to the server to decode the authorization header,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=170.096) [verify the user name and password by checking with the operating system or checking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=174.396) [against something that's in a database](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=179.386) [or whatever credential management system is configured on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=180.916) [If the credentials match the server can make a reply and say yes, here's the account resource.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=184.746) [If the credentials don't match, the server should respond with a 401 status,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=189.796) [you are still unauthorized to view this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=194.926) [( pause )](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=198.516) [So with my browser I can currently get to the search dot cshtml page that's in my Website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=204.836) [But let me flip over into IAS and for this test directory, for this test application I'm going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=210.606) [into the authentication settings and disable anonymous authentication effectively not](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=216.636) [allowing anonymous users into the site and enable basic authentication.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=222.576) [You can see that IAS gives me the warning that SSL is not enabled](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=227.356) [and credentials will be sent in clear text.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=231.746) [That's just a way of saying that since you are not using SSL, aka secure HTTP,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=233.886) [that the user name and password will be visible in the message to anyone](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=239.046) [that is able to view that message.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=242.846) [Now let's refresh the page and by the way I have Fiddler running in the background](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=245.106) [so we'll be able to see this request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=249.466) [And now I'm going to log on as a user that has an account on this machine](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=251.296) [and now I can get to search dot cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=255.996) [So anonymous access was disabled, I needed to authenticate as a user on this machine in order](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=258.716) [to be able to get in and let's just take a look at what that looks like in Fiddler.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=264.126) [First there was my initial get request to get search dot cshtml.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=268.606) [The server challenged that by returning an HTTP 401 status message saying you are unauthorized,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=276.596) [please use basic authentication in the local host realm.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=283.816) [And we would have seen that local host text up here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=287.176) [in the dialogue that popped up for me to login.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=290.146) [And so the next request that the browser sent off after I entered in the user name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=292.586) [and password was one that said please get search dot cshtml and use this authorization header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=297.176) [Let me just take this value which looks encrypted but it's really just encoded,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=303.886) [it's base 64 encoded and we'll paste it into a base 64 decoder and tell it to decode](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=308.526) [and that's the user name, that's the password.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=315.346) [And that's why we say that basic authentication is insecure.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=317.996) [Basic authentication really isn't used that much and when it is used it's typically over httbfs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=321.766) [And once the browser has those credentials I can keep accessing this Website.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=327.276) [Let me turn capturing back on and I'm just going to refresh search dot cshtml a few times](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=331.826) [and each time I do that we're going to be sending off a request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=337.696) [that includes that authorization header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=342.396) [You can see that each of those 200 requests sent off an authorization header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=344.736) [Digest authentication is another authentication protocol that's included as part](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=355.736) [of the HTTP specification and it is an improvement over basic authentication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=360.096) [because it does not transmit user passwords using base 64 encoding.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=364.326) [Instead the client sends a digest of the password and the client needs](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=369.656) [to compute this digest using an Md5 hashing algorithm with a nonce](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=373.596) [that the server provides during the authentication challenge](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=377.636) [that helps to prevent replay attacks.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=381.026) [So this is very similar to basic authentication, there's still a www dash authenticate header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=383.066) [that the server will send back, it just includes some additional information](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=388.746) [that the client will need to use in his calculations](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=392.216) [so they have some cryptic graphic value.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=395.186) [And then the client will also send back another request with an authorize header](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=397.316) [that now includes an encrypted form of the user name and password.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=401.946) [And the server again can validate those and let the request through or reject the credentials](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=405.656) [and say this is still an unauthorized request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=410.636) [So digest authentication is better then basic authentication when secure HTTP is not available](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=414.106) [but it's still far from perfect because digest authentication is still vulnerable](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=419.626) [to man in the middle attacks.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=423.806) [That's where someone can install it say a malicious proxy server that's looking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=425.166) [at HTTP messages as the flow across the network](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=430.096) [and it sees what your authorization token is using digest authentication.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=433.196) [Someone can still steal that piece of information and use it to access the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=5&mode=live&start=437.936)

[Windows Authentication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live)

[Windows integrative authentication is very popular](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=1.416) [when you have Microsoft servers and Microsoft products.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=3.866) [Although it is supported by many modern browsers, not just Internet Explorer,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=7.036) [it's just that it does require Windows machine as you Web server and it doesn't work so well](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=11.196) [over the internet or where proxy servers might reside.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=16.076) [So it's commonly used for internal and internet Websites particularly at companies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=18.976) [that have Microsoft active directories set up and they're using active directory](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=23.506) [to manage their users and groups and permissions.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=27.596) [Windows authentication behaves very much like basic and digest authentication in the sense](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=30.706) [that a client makes a request for a resource that has been secured](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=35.196) [so the server will challenge that request with an HTTP 401 status code reply saying](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=39.236) [that was unauthorized, please authenticate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=44.846) [And in this case the value of the dub dub dub dash authenticate header will be negotiate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=47.586) [That's a key word, the client will interpret](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=52.456) [to mean Windows authentication specifically we can negotiate on the protocol](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=55.456) [because Windows supports a couple different security providers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=60.186) [There's NTLM and there's Kerberos.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=63.486) [We can pick which one and agree on it](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=65.776) [and the next request I'll send along some credential information that will be encrypted.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=67.596) [You can decipher that and figure out if the credentials are good or not](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=72.406) [and allow me in with the next request.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=75.296) [And that still comes up in an authorize header.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=76.906) [So because things are encrypted Windows authentication has the advantage](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=79.716) [of being a little more secure even without using secure HTTP](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=83.056) [and in some cases it can even be unobtrusive.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=86.456) [So let's go into IAS and what I'm going to do is disable basic authentication.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=89.536) [And enable Windows authentication and I'll also point](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=94.016) [out that I would have digest authentication available here](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=98.476) [as an option if I had it installed in IAS.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=101.246) [But it does require an active directory server to be available and I don't have](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=104.576) [that available so it's not an option here.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=108.036) [Windows authentication ironically is available without active directory server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=110.226) [What we'll be authenticating against is just the users that are on this machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=114.796) [So with that in place let's open up Chrome and try to get to this page again.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=118.516) [And now I'll be prompted to enter a user name and password and Chrome sort](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=123.146) [of knows what credentials I'm using here on the Windows machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=128.236) [I could go ahead and try those or I could enter in the credentials for a different user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=131.536) [and that allows me to get to the page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=137.296) [Now I can also come over into Internet Explorer and we go to search dot cshtml](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=141.056) [and I'm just instantly taken there but that's because in Internet Explorer one of the options](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=150.526) [that you can set here, if we go into custom level for security,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=156.526) [is that it will automatically log me in with my current user name and password for sites](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=161.096) [that are in a specific zone and that means it's using the same credentials that I used to log](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=167.386) [in to this machine to access the server which in this case is what I wanted.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=172.156) [And that usually works really well in an active directory setting.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=6&mode=live&start=176.346)

[Forms Authentication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live)

[Forms authentication is the most popular approach](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=1.776) [to user authentication over the internet.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=4.516) [Forms based authentication is not a standard authentication protocol](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=6.836) [and it doesn't use the www dash authenticate or authorize headers that we've seen so far.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=10.516) [However, many Web application frameworks provide some out of the box support](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=16.816) [for forms based authentication and the application has complete control](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=20.606) [over how the authentication behaves,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=24.606) [how to validate credentials, how the sign in form appears.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=26.726) [And that's because with forms based authentication the client will make a request](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=30.036) [for a secure resource and the server will respond](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=34.236) [by redirecting the browser to a login page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=37.436) [That's a HTTP 302 temporary redirect.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=40.816) [And generally the URL that the user is requesting might be included in the query string](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=43.486) [of the redirect location so that once the user has completed logging in,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=48.686) [the application can then redirect them again back](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=52.786) [to the secure resource that they were trying to reach.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=55.006) [We call this forms authentication because the place where we are redirecting the user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=58.196) [to is typically a page that has a form with inputs where the user can enter their user name](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=62.026) [and their password and then it will have a button to click to do the login.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=67.956) [That will submit a post operation to the login destination and the application has](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=71.316) [to take the credentials that were entered and validate them against the database](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=77.116) [or the operating system or whatever credential management system it's using.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=81.326) [Notice that forms based authentication will transmit a user's credentials in plain text](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=84.976) [so just like basic authentication forms based authentication does not secure unless you're](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=90.736) [using HTTPs or secure HTTP.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=95.296) [And most Web frameworks once you have entered the proper credentials will respond](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=98.106) [to that post request with the credentials with another redirect back to the URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=105.196) [that you were trying to get to like slash account](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=109.436) [and in that response it will also set a cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=111.756) [And that cookie will indicate that the user is authenticated.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=115.096) [Very commonly that cookie value is going to be encrypted and hashed to prevent tampering.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=119.156) [But just remember that without HTTPs that cookie's still vulnerable to being intercepted](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=124.506) [because everything is being transmitted across the network in plain text.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=129.576) [However, forms authentication remains very popular](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=133.266) [because again it gives you complete control over the login experience.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=135.936) [Let me give you an example of what this would look like in terms of user experience.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=139.456) [I'm going to try to go to a secure location on github, my inbox.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=144.356) [When I press enter it detects that I'm trying to get to a secure resource,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=149.066) [it doesn't know who I am, so it's going to redirect me to a login page and in the URL](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=153.056) [for that login page it's going to have a return to address.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=158.056) [So if I'm properly authenticated it should be able to send me back there.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=161.546) [And so once I login, it determines that really is me,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=167.046) [it's able to send me over to my notifications page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=170.456) [So behind the scenes that was just a couple of HTTP redirects and a login page.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=7&mode=live&start=174.436)

[OpenID](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live)

[Finally I thought I'd give a brief mention about open ID](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=1.356) [because open ID is slowing gaining some acceptance](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=4.596) [and here's the problem that it solves.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=7.676) [Forms based authentication gives an application complete control over user authentication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=9.886) [but many applications do not want that level of control.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=14.926) [Specifically when I write an application I'd like to avoid managing and verifying user names](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=18.406) [and passwords because it's a risk to store user passwords in my database.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=23.236) [Most people try to avoid passwords and store just hashed values of passwords but even then,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=28.396) [most users don't want to have a different user name and password](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=34.026) [for every Website that they go to.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=37.126) [And it's usually a bad idea to share credentials across multiple Websites.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=39.066) [Open ID can solve many of these problems because it's an open standard](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=43.956) [for decentralized authentication.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=47.456) [So with open ID I would go out and register with an open ID identity provider](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=50.126) [and the identity provider's the only site that needs to store and validate my credentials.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=54.986) [There's a lot of providers around now including Google and Yahoo and VeriSign.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=60.016) [When an application like stack overflow needs to authenticate a user it works with the user](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=63.856) [and the identity provider, there's some communication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=69.836) [between the application and identity provider directly.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=72.746) [There's also a communication between the user and the identity provider directly](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=75.866) [and the user ultimately has to verify the user name and password with the identity provider.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=80.836) [And the application will find out if that was successful or not thanks to the presence](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=85.996) [of some cryptographic tokens and secrets that are going to be exchanged.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=91.026) [So while open ID has a lot of benefits compared to forms authentication, it has faced a lack](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=95.246) [of adoption due to complexity in implementing, debugging and maintaining open ID and keeping it](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=100.546) [up and running and understanding how it works in your system.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=106.626) [As the toolkits and frameworks continue to evolve,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=109.126) [I expect that to make open ID authentication easier and the adoptions going to grow.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=8&mode=live&start=112.696)

[Secure HTTP](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live)

[Finally we'll touch on the topic that we've danced around a few times](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=2.596" \t "psplayer) [and that is secure HTTP, also known as HTTPs, also known as SSL or TLS.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=5.666) [There's all sorts of different acronyms for this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=12.966) [And basically it all comes down to this.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=14.956) [We've talked about how self describing textual messages are one of the strengths of the Web](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=17.036) [because anyone can read a message and understand what's inside but there's a lot of messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=21.476) [that we need to send that we don't want anyone else to see.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=25.696) [We don't want them to see our passwords, we don't want them to see our credit card numbers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=29.176) [Secure HTTP solves this problem by encrypting messages before they start traveling](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=33.266) [across the network.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=37.616) [Secure HTTP is known is known as HTTPs because it uses an HTTPs scheme](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=39.706) [in the URL instead of a regular HTTP scheme.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=45.506) [That's primarily because the default port for HTTP is port 80](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=48.636) [and the default port for HTTPs is port 443.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=52.576) [The browser will connect to the proper port depending](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=57.216) [on the scheme unless you've specified an explicit port in the URL.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=59.286) [HTTPs works by adding an additional security layer in the network protocol stack.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=63.646) [You remember we talked about the network protocol stack when we were looking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=68.976) [at HTTP connections and we know that a message coming](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=72.266) [out of an application that's an HTTP message and has to go through TCP, go through IP,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=75.386) [go out across the wire and then come up into the server by reversing through that protocol stack.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=80.736) [HTTPs is essentially adding another layer, a secure sockets layer](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=86.886) [or transport layer security TLS between the application and the transport layers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=91.336) [So before that message even reaches the IP layer and well before it reaches your network card,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=97.196) [it has been encrypted and the only thing that can decrypt that message is the other party.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=102.706) [HTTPs requires the server to have a cryptographic certificate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=109.776) [That certificate is sent to the client during the set up of HTTPs,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=114.276) [during the set up of the communication channel](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=117.306) [and that certificate includes the server's host name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=120.206) [Now a browser can use that certificate to validate that it is truly talking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=123.546" \t "psplayer) [to the server that it thinks it's talking to.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=127.276) [And that validation is all made possible using public key cryptography and the existence](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=129.856" \t "psplayer) [of certificate authorities like Bearsign (phonetic) that will sign and vouch](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=135.376) [for the integrity of certificate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=139.126) [Administrators have to purchase and install certificates from certificate authorities](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=141.096) [and install them on the Web server for this all to work.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=145.686) [There's a lot of cryptographic details that we could cover](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=148.896) [but from a developer's perspective here's the most important things to know.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=151.456) [First of all, all traffic over HTTPs is encrypted in the request and the response.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=154.976) [That includes the HTTP headers and the message body](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=160.316) [and basically everything except the host name.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=163.506) [That means that the URL path and the URL query string is encrypted as well as all cookies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=166.616) [So HTTPs prevents session high jacking](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=172.036) [because no eavesdroppers can inspect a message and steal a cookie.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=174.786) [Another thing to know is that the server is authenticated](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=179.476) [to the client thanks to the server's certificate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=182.216) [If you are talking to bigbank.com over HTTPs you can be sure your messages are really going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=185.006) [to bigbank.com and not someone who stuck a proxy server from the network to intercept requests](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=191.506) [and spoof response traffic from bigbank.com.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=196.806) [Another thing to know is that HTTPs does not authenticate the client.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=201.776) [So applications still need to implement forms authentication](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=205.666) [or one of the other authentication protocols mentioned earlier.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=208.466) [HTTPs does make forms based authentication and basic authentication more secure](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=211.896) [since all data is encrypted, even the cookies.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=216.236) [And there is the possibility of using what we call client side certificates with HTTPs.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=219.046) [And client side certificates would authenticate the client](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=224.866) [in the most secure manner possible however, client side certificates are generally not used](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=227.856) [on the open internet since many users will not purchase and install a personal certificate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=232.636) [I've worked for a lot of clients and corporations that require client certificates](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=237.816) [for employees and contractors to access corporate servers because in](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=241.306) [that case the corporation can act as a certificate authority and issue employees](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=245.626) [and contractors their own certificates.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=250.136) [Now HTTPs does have some downsides and most of them are related to performance.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=252.506) [HTTPs is computationally expensive and large sites often use specialized hardware,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=256.996) [we call them SSL accelerators, they help](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=262.536) [to take all the cryptographic computational load off the Web servers.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=265.216) [HTTPs traffic is also impossible to cache in a public cache](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=268.426) [because once a message is encrypted, it's intended for a single user.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=273.696) [However, user agents might keep HTTPs responses in their private cache.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=277.656) [And finally, in regards to performance, HTTPs connections are expensive to set up](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=282.896) [and they require some additional hand shakes between the client and server](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=287.546) [to exchange cryptographic keys](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=290.736) [and insure everyone is communicating with the proper secure protocol.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=292.726) [Persistent connections that we talked about in the third module,](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=296.296) [they can help to amortize the cost of setting up a HTTPs connection.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=299.396) [But in the end if you need secure communications, then you're willingly going](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=304.116) [to pay for the performance penalties.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=308.366) [Let me just point out that in my browser my communications in my login](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=310.776) [with github was all done over HTTPs and that's one of the reasons](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=315.976) [that I really can't use a tool like Fiddler to even intercept these HTTP messages](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=320.826) [because everything is encrypted as it's leaving the browser.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=325.066) [Although there are some tricks you can use to get around it on a local machine.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=328.856) [And if I click the lock icon up here, I can get some more information about the encryption.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=332.296) [First of all I can see that the certificate that was given to GitHub, Incorporated was issued](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=338.046) [by DigiCert and that they have verified their location.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=343.736) [And that this is all happening with 256 bit encryption using transport layer security.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=347.056) [I can see the cryptographic algorithms that are in place and that's all good information.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=352.926) [Everything looks good about this server and its certificate.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=359.396) [So I can trust that the communication between my browser](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=362.336) [and github isn't going to be intercepted by anybody.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=9&mode=live&start=365.336)

[Summary](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live" \t "psplayer)

[In this module we went quickly through some of the most popular authentication mechanisms](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=2.216) [in use on the Web today and you should know a little more now](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=6.246) [about the various trade-offs involved.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=9.186) [We also talked about cookies and saw some examples of how we can use cookies](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=11.396) [to track users and track user state on the server.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=14.856) [And now this is the last module of the course.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=17.716) [I hope you enjoyed the material and that you were able](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=20.106) [to take away an in-depth knowledge of HTTP and how it works.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=22.786) [Thanks for watching.](https://app.pluralsight.com/player?course=xhttp-fund&author=scott-allen&name=xhttp-fund-m5-security&clip=10&mode=live&start=26.536)