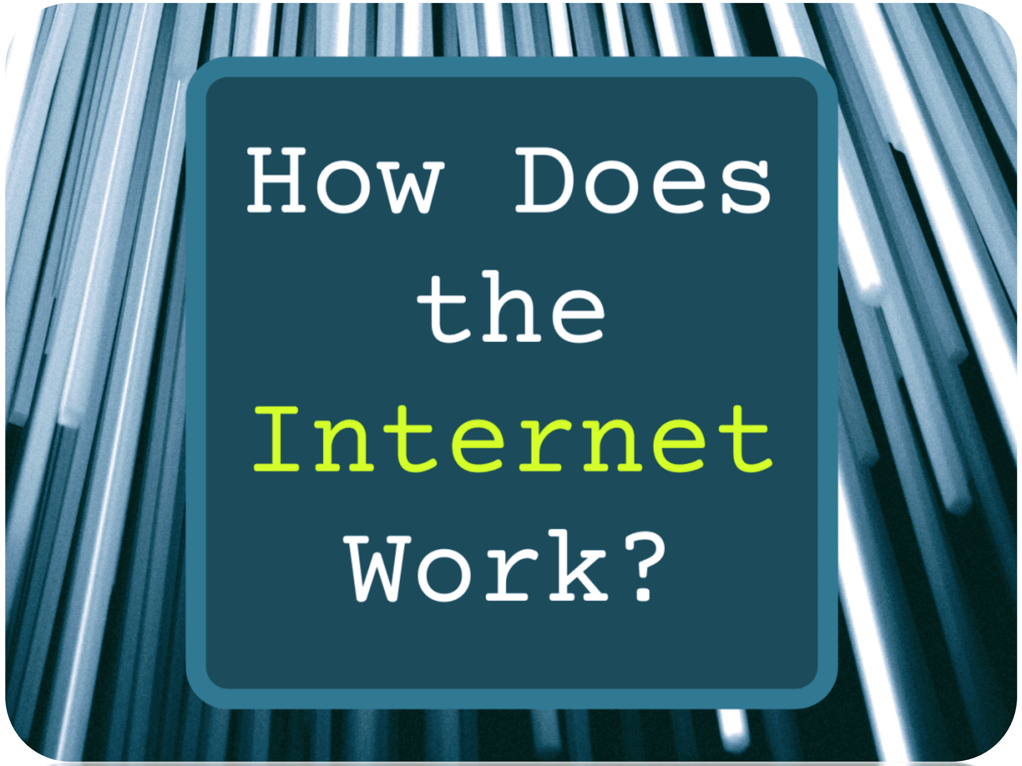
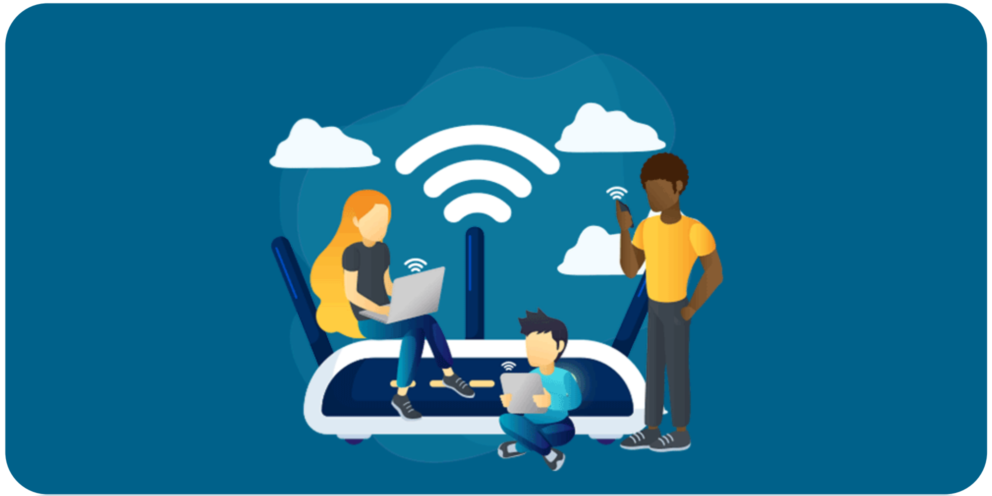
Lesson 2 – How the Web Works



Lesson 2 – How the Web Works – The Internet Versus the Web – The Internet

The Internet is a network of connected computers.



Not a single company owns the Internet.

The Internet is a cooperative effort governed by a system of standards and rules.

The ultimate goal: to share information. Data or documents are shared over the Internet.

How is information shared? Information is shared using protocols.

Three popular protocols are HTTP, HTTPS, and FTP.

Lesson 2 – How the Web Works – The Internet Versus the Web – The Web

The Web (originally called the World Wide Web, it’s where the WWW comes from), is one of many ways of sharing data over the Internet.

The Web allows documents (files) to be linked to one another using hypertext links.

This forms a huge web of connected information.

The Web uses the protocol called HTTP.

It also uses HTTPS, and it also uses FTP.

Lesson 2 – How the Web Works – The Internet Versus the Web – Protocols Explained

HTTP stands for Hyper Text Transfer Protocol – it is the primary method that many clients use to access documents on The Web.

HTTPS stands for Hyper Text Transfer Protocol Secure – is the secured version of HTTP.

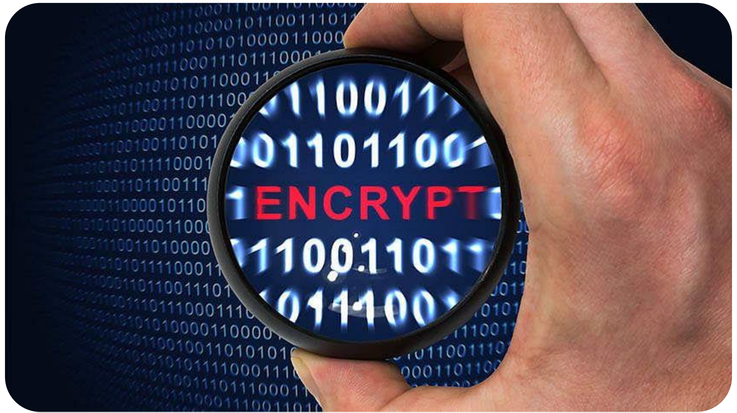
HTTPS provides secure communication between a web browser and a client.

Lesson 2 – How the Web Works – The Internet Versus the Web – Protocols Explained

HTTPS uses encryption and authentication to secure data transfer.

Encryption is the process of changing electronic information into a secret code that only authorized parties can understand.

Authentication is the process of verifying that someone or something is who or what they say they are.



Lesson 2 – How the Web Works – Serving Up Your Information

Many computers make up the Internet.

Because they serve documents upon requests,
these computers are known as servers.

The server is actual software, running on a computer.

The computer is not the server itself.

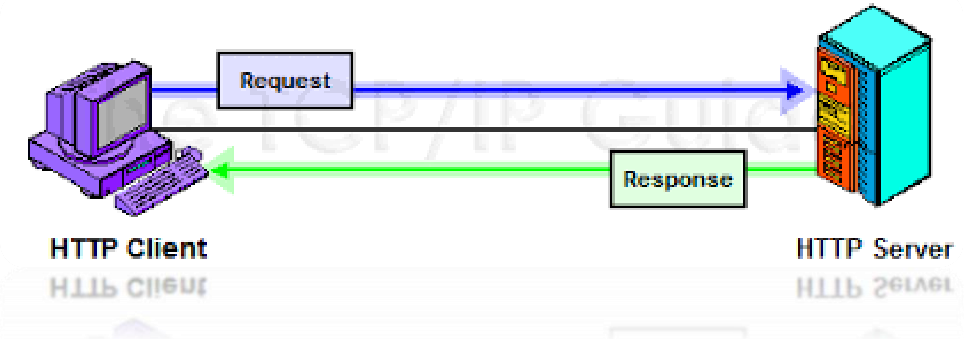
Although in many cases, the word “server” is commonly used to refer to a computer as well.

Lesson 2 – How the Web Works – Serving Up Your Information – The Server

The server is built to communicate with other computers.

The server's role is to wait for requests for information, then retrieve and send that information back as quickly as possible.

Web servers are also called "HTTP servers."



There are many server software options.

Two popular ones are Apache (open source software), and Microsoft Internet Information Services (IIS).

Lesson 2 – How the Web Works – Serving Up Your Information – Your Device’s IP Address

Every computer and device (modem, router, smartphone, cars, etc.) connected to the Internet is assigned a unique numeric IP address.

IP stands for Internet Protocol.

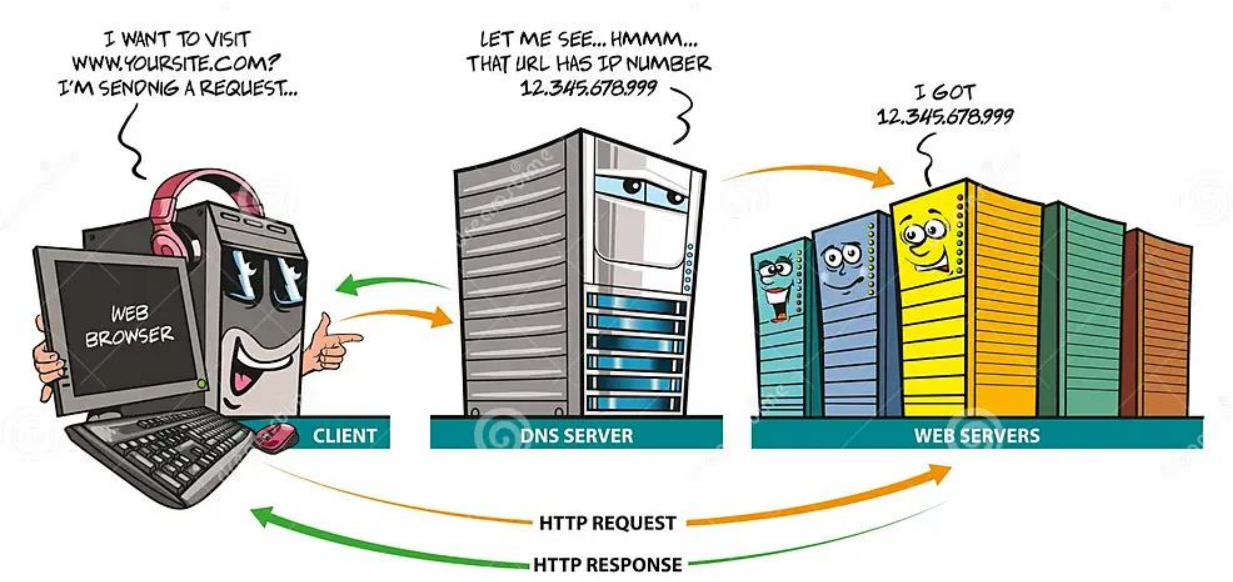
IP addresses usually look like this: 208.201.239.100.

All of these numbers can be difficult for humans.

→ 18.96.72.9
→ 90.76.1.88
→ 35.68.2.11

Lesson 2 – How the Web Works – Serving Up Your Information – Your Device’s IP Address

Domain Name System (DNS) was developed to allow human-friendly names to refer to servers.


I WANT TO VISIT WWW.YOURSITE.COM? I'M SENDNIG A REQUEST...
LET ME SEE... HMMM... THAT URL HAS IP NUMBER 12.345.678.999
I GOT 12.345.678.999
WEB BROWSER
CLIENT
DNS SERVER
WEB SERVERS
HTTP REQUEST
HTTP RESPONSE

The numeric IP address is useful for computer software.

The domain name is human-friendly.

DNS servers match numeric IP addresses with domain names.

Lesson 2 – How the Web Works – Serving Up Your Information – A Word About Browsers

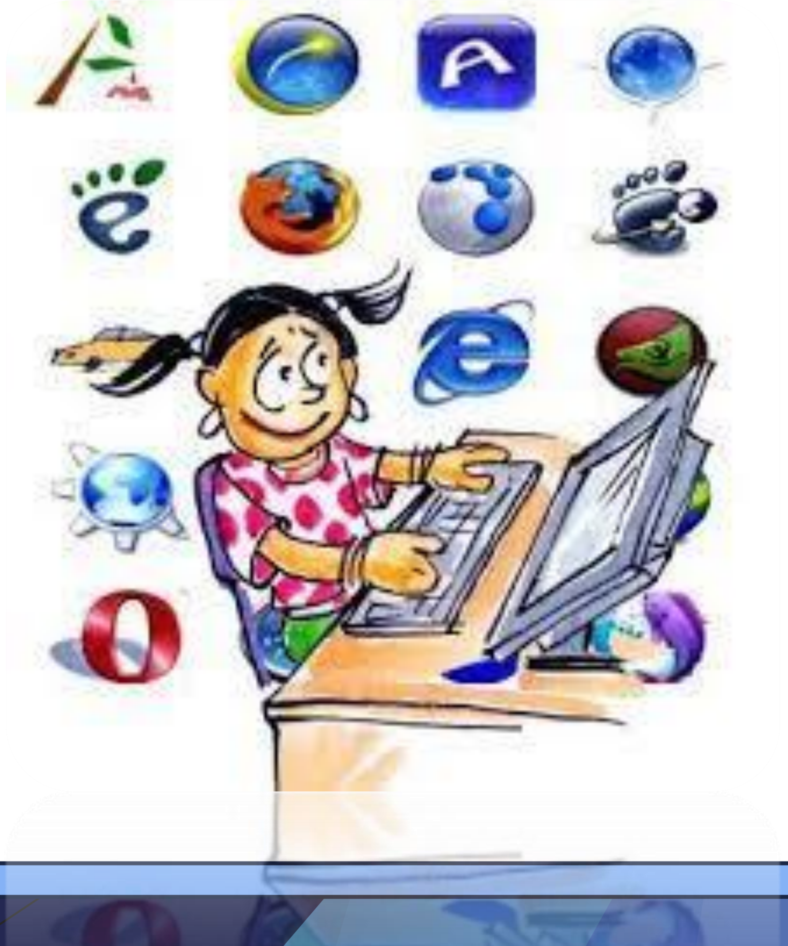
We learned that a server serves information or data that is requested. This is special software designed to handle these types of requests.

The software that does the requesting is called a client.

People use desktop browsers, mobile browsers, and other assistive technologies (such as screen readers) as clients to access documents on the Web.

The server returns the documents for the browser

The browser is referred to as the user agent in technical circles



Lesson 2 – How the Web Works – Serving Up Your Information – A Word About Browsers

<u>HTTP</u> protocol handles all <u>requests</u> and <u>responses</u>.

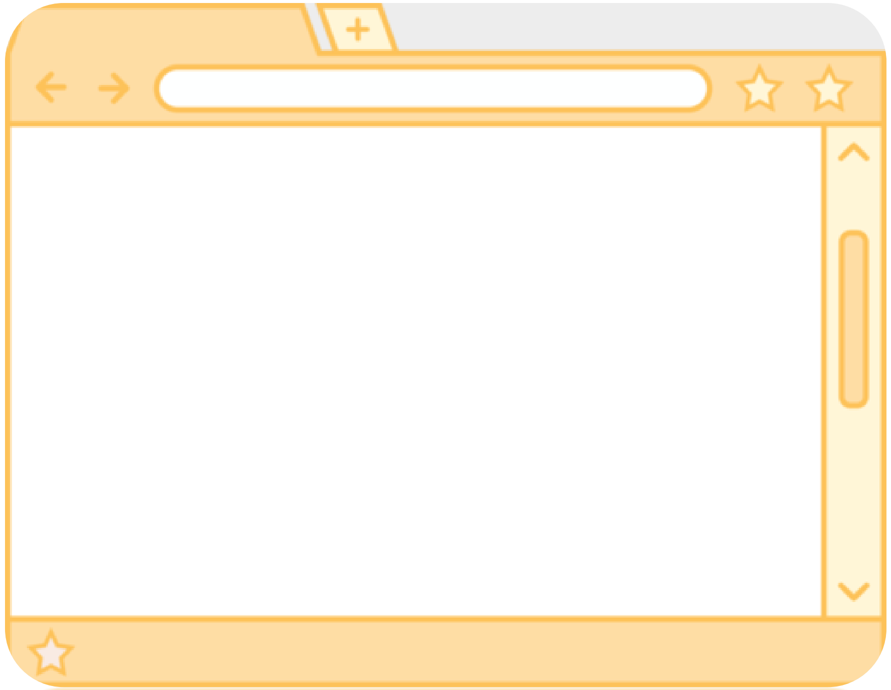
Documents are not the only type of data that can be sent over the HTTP/HTTPS protocol.

Images, movies, audio files, data, scripts, and all other web resources that commonly make up web sites and applications can also be handled by the HTTP protocol.

The gateway to the Internet is typically a piece of software called a browser.

Lesson 2 – How the Web Works – Serving Up Your Information – A Word About Browsers

It is common to think of a browser as a window on a computer monitor with a web page displayed in it.



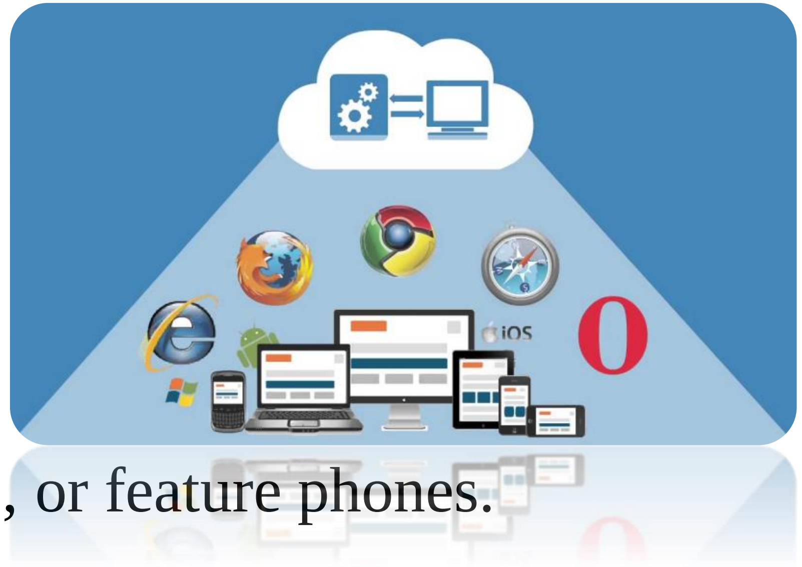
These are known as graphical browsers or desktop browsers. For a long time, they were the only way to view the web.

Some popular web browsers are Internet Explorer for Windows, Chrome, Firefox, and Safari, and Opera.

Accessing the web on your mobile is the same process.

Lesson 2 – How the Web Works – Serving Up Your Information – A Word About Browsers – Mobile Browsers

Most web browsers will work on mobile phones or tablets.



Some mobile phones will have their own web browsers.

A mobile browser is a web browser that is designed to be used on mobile devices, such as smartphones, tablets, PDAs, or feature phones.

Mobile browsers are optimized to display web content on small screens.

Mobile browsers provide access to content and applications from the Internet and in the cloud.

Lesson 2 – How the Web Works – Serving Up Your Information – A Word About Browsers – Mobile Browsers

Over 75% of websites are "mobile friendly“.

This means they automatically create a "mobile" version of the page when a request comes from a mobile device.

This version is designed to fit the device's screen and be usable with a touch interface.

Some examples of mobile browsers include Chrome, Safari, Firefox, and Microsoft.

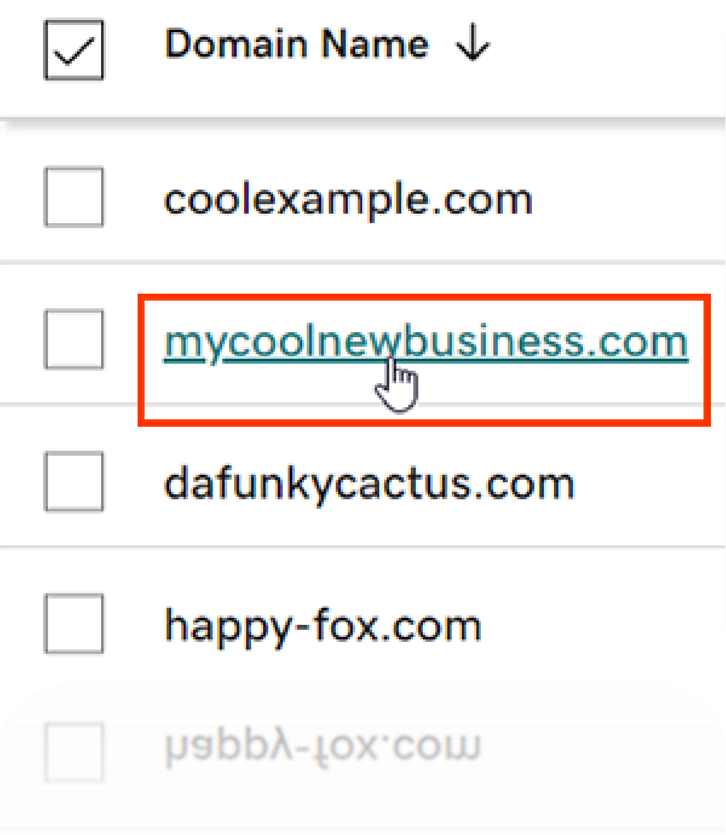
Lesson 2 – How the Web Works – Web Page Addresses (URLs)

Every page and resource on the Web has its own special address called a URL.

URL stands for Uniform Resource Locator.

URLs are the methods that we access HTML documents on the web.

Mainly because they are human friendly.



☑ Domain Name ↓

□ coolexample.com

□ mycoolnewbusiness.com

□ dafunkycactus.com

□ happy-fox.com

Lesson 2 – How the Web Works – Web Page Addresses (URLs)

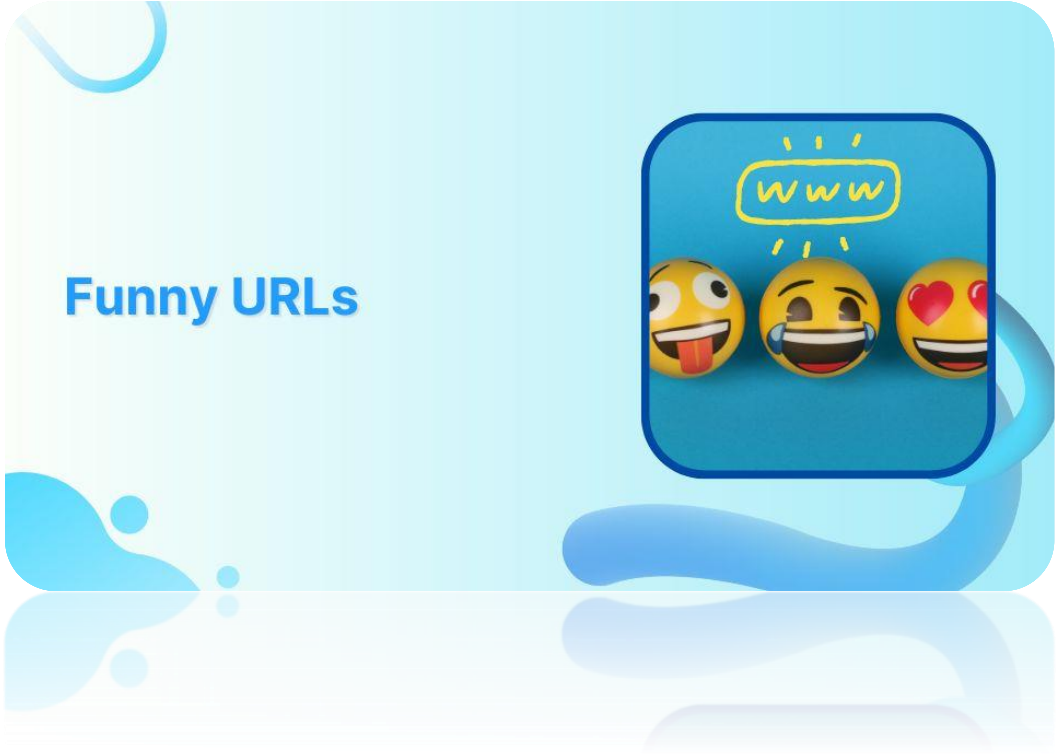
URLS are Unique

Some URLs are short and sweet.

Others may look like crazy strings of characters separated by dots (periods) and slashes.

https://cat-bounce.com/

http://www.everydayim.com/



URLs can be any name (in most cases)!

Each part of the URL has a specific purpose.

Let’s dissect.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL (Technical – Pay Attention!)

URLs

Generally, URLs are made up of three components.

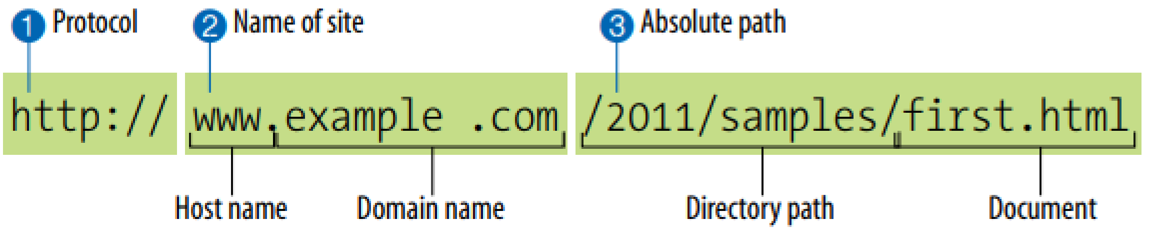


Figure 2-1. The parts of a URL.

1 `http://`

- The first part of a URL is the protocol.
- Protocols are used for internet transactions.
- HTTP protocol let the server know to use Hypertext Transfer Protocol, or get into “web mode.”

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL (Technical – Pay Attention!)

URLs

Generally, URLs are made up of three components.

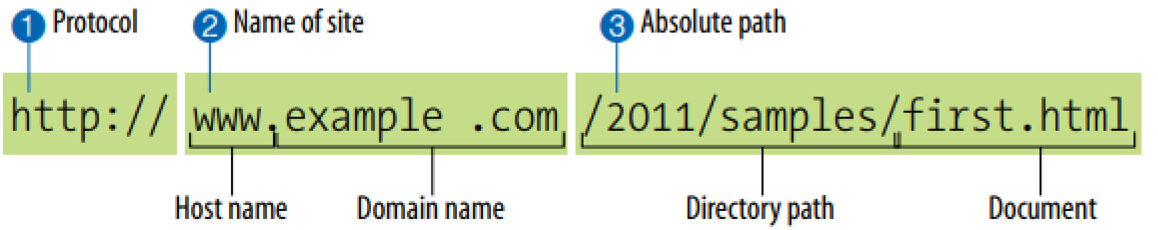


Figure 2-1. The parts of a URL.

2 www.example.com

- The next portion of the URL identifies the website by its domain name.
- In this example, the domain name is example.com.
- The “www.” part at the beginning is the particular host name at that domain.
- The host name “www” has become a convention, but is not a rule.
- There can be more than one website at a domain (sometimes called subdomains).
- For example, there might also be development.example.com, clients.example.com, and so on.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL (Technical – Pay Attention!)

3

```
/2012/samples/first.html
```

This is the absolute path through directories on the server to the requested HTML document, first.html. The words separated by slashes are the directory names, starting with the root directory of the host (as indicated by the initial /). Because the Internet originally comprised computers running the Unix operating system, our current way of doing things still follows many Unix rules and conventions, hence the / separating directory names.

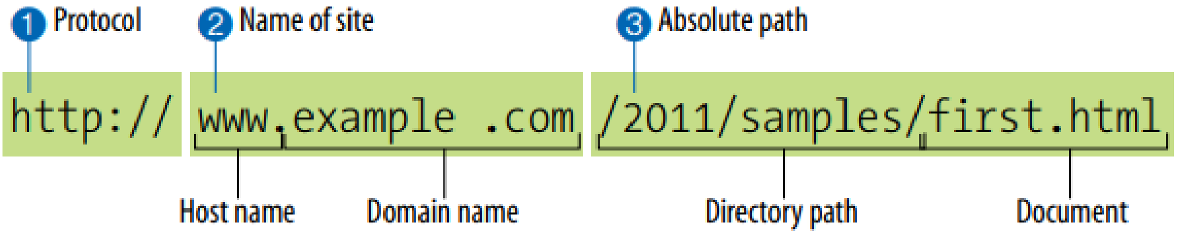


Figure 2-1. The parts of a URL.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL (Technical – Pay Attention!)

To sum it up, the URL in Figure 2-1 says it would like to use the HTTP protocol to connect to a web server on the Internet called www.example.com and request the document first.html (located in the samples directory, which is in the 2012 directory).

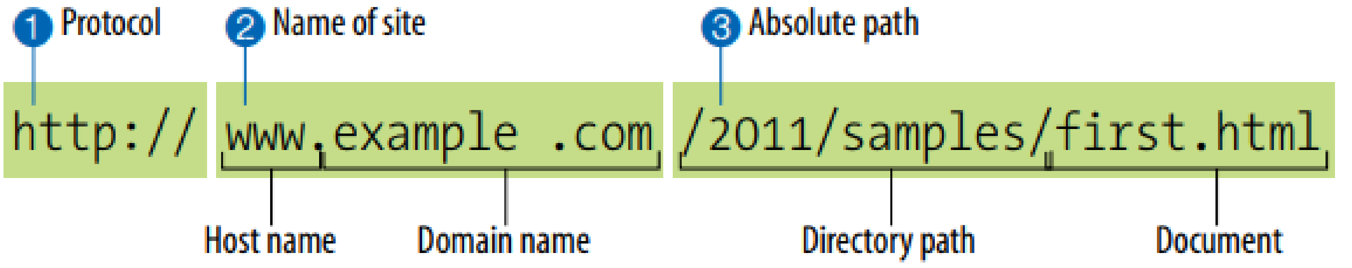


Figure 2-1. The parts of a URL.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL (Technical – Pay Attention!)

Letters after the final period in a URL are called a domain suffix.
Domain suffix refers to the website's Top-Level Domain (TLD).
The most common TLD is ".com". Other common TLDs include:

.org - which is typically used for nonprofits
.gov - which is used for government agencies
.edu - which is used for educational institutions
.net - which is used for network technology organizations
.mil - which is used for military organizations
.int - which is used for intergovernmental organizations

The Domain Name System of the Internet manages TLDs. TLDs are translated into Internet Protocol (IP) addresses.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL – “No http://in URLs” (Sidenote)

Hey, There’s No http:// on That URL!

What happens when there is no http:// in a URL and you access a website?

Because nearly all web pages use the Hypertext Transfer Protocol, the http:// part is often just implied.

This is the case when site names are advertised in print or on TV, as a way to keep the URL easy to remember.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL – “No http://in URLs” (Sidenote)

Additionally, browsers are programmed to add http:// automatically as a convenience to save you some keystrokes. It may seem like you’re leaving it out, but it is being sent to the server behind the scenes.

When we begin using URLs to create hyperlinks in HTML documents in Chapter 6, Adding Links, you’ll learn that it is necessary to include the protocol when making a link to a web page on another server.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – The Parts of a URL – “No http://in URLs” (Sidenote)

When we begin using URLs to create hyperlinks in HTML documents in Chapter 6, Adding Links, you’ll learn that it is necessary to include the protocol when making a link to a web page on another server.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – Default Files

Obviously, not every URL you see is so lengthy. Many addresses do not include a filename, but simply point to a directory, like these:

http://www.oreilly.com

http://www.jendesign.com/resume/

When a server receives a request for a directory name rather than a specific file, it looks in that directory for a default document, typically named index.html.

So when someone types the above URLs into their browser, what they'll actually see is this:

http://www.oreilly.com/index.html

http://www.jendesign.com/resume/index.html

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – Default Files

The name of the default file (also referred to as the index file) may vary, and depends on how the server is configured. In these examples, it is named index.html, but some servers use the filename default.htm. If your site uses server-side programming to generate pages, the index file might be named index.php or index.asp. Just check with your server administrator or the tech support department at your hosting service to make sure you give your default file the proper name.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – Default Files

Another thing to notice is that in the first example, the original URL did not have a trailing slash to indicate it was a directory. When the slash is omitted, the server simply adds one if it finds a directory with that name.

The index file is also useful for security. Some servers (depending on their configuration) display the contents of the directory if the default file is not found.

Figure 2-2 shows how the documents in the housepics directory are exposed as the result of a missing default file.

Lesson 2 – How the Web Works – Web Page Addresses (URLs) – Default Files

One way to prevent people from snooping around in your files is to be sure there is an index file in every directory.

Your server administrator may also add
other protections to prevent your directories from displaying in the browser.

Lesson 2 – How the Web Works – The Anatomy of a Web Page

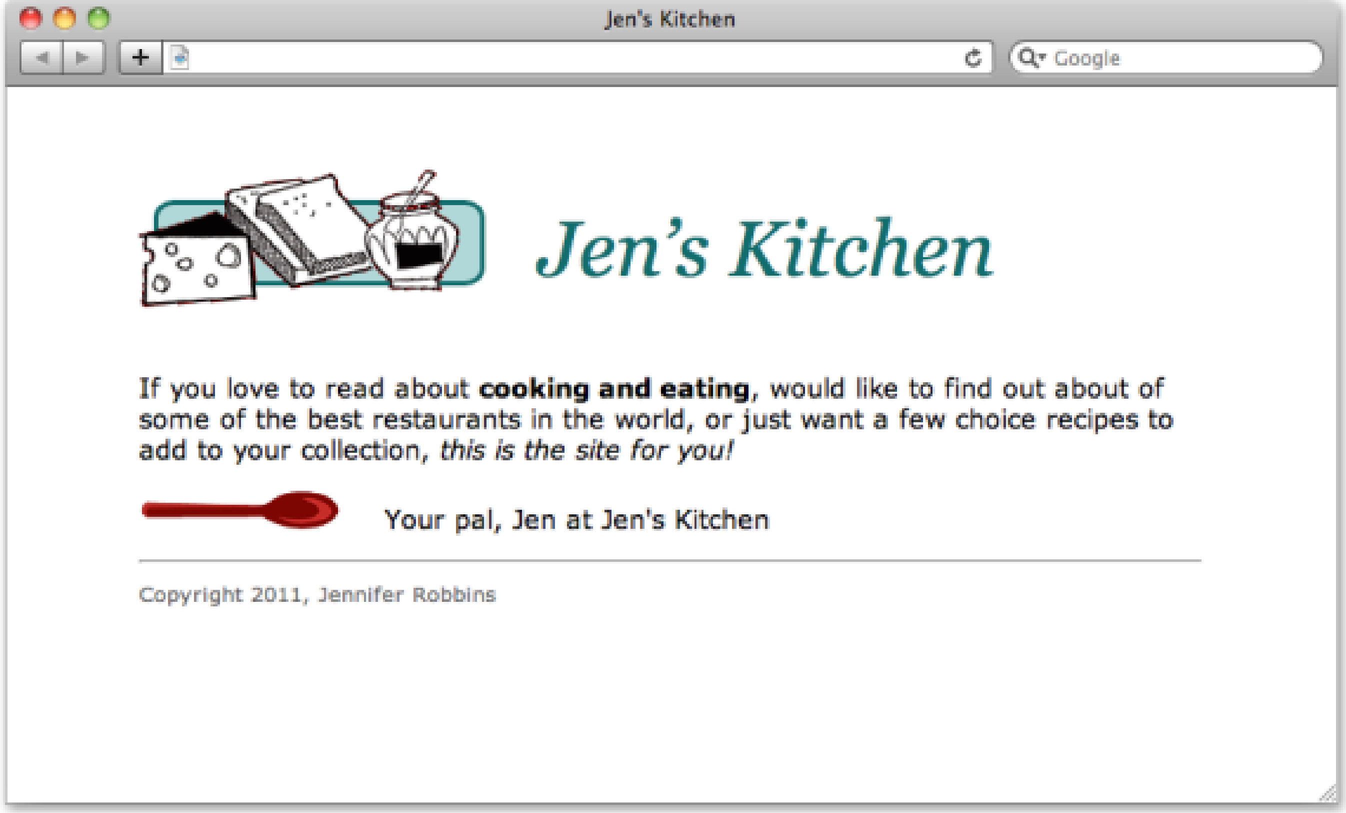
We’re all familiar with what web pages look like in the browser window, but what’s happening “under the hood?”

At the top of Figure 2-3, you see a minimal web page as it appears in a graphical browser.

Although you see it as one coherent page, it is actually assembled from four separate files:
an HTML document (index.html),
a style sheet (kitchen.css), and
two graphics images (foods.gif and spoon.gif).

The HTML document is running the show.

Lesson 2 – How the Web Works – The Anatomy of a Web Page



Jen's Kitchen

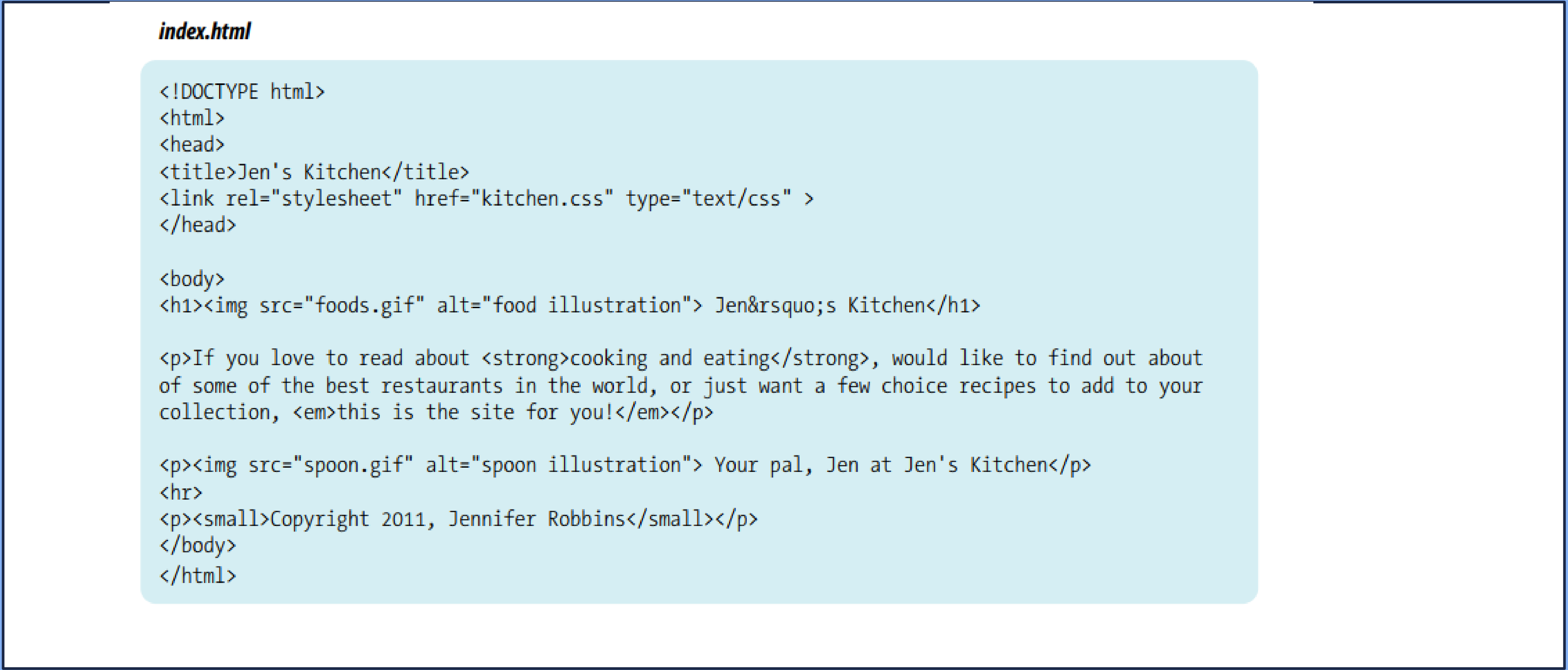
If you love to read about **cooking and eating**, would like to find out about of some of the best restaurants in the world, or just want a few choice recipes to add to your collection, *this is the site for you!*

Your pal, Jen at Jen's Kitchen

Copyright 2011, Jennifer Robbins

The web page shown in this browser window consists of four separate files: an HTML text document, a style sheet and two images. Tags in the HTML source document give the browser instructions for how the text is structured and where the images should be placed.

Lesson 2 – How the Web Works – The Anatomy of a Web Page



index.html

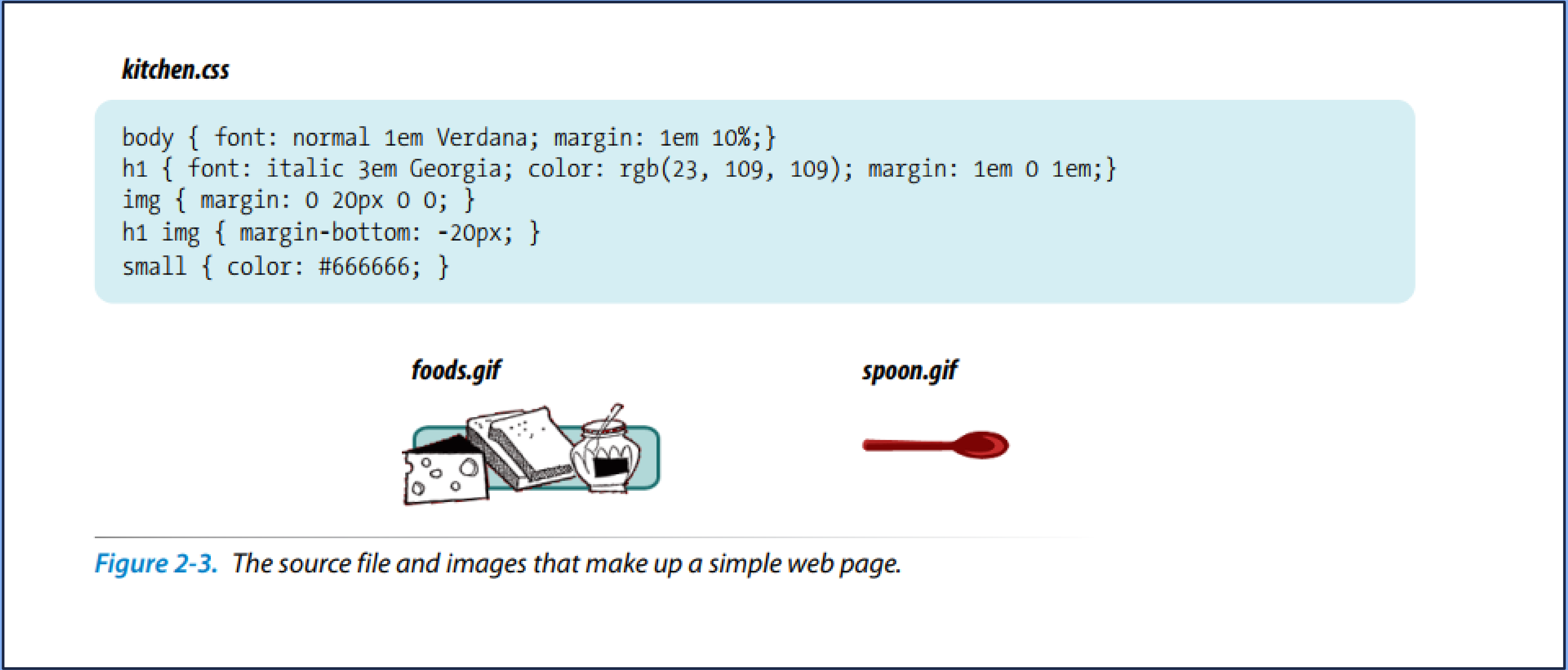
```
<!DOCTYPE html>
<html>
<head>
<title>Jen's Kitchen</title>
<link rel="stylesheet" href="kitchen.css" type="text/css" >
</head>

<body>
<h1><img src="foods.gif" alt="food illustration"> Jen&rsquo;s Kitchen</h1>

<p>If you love to read about <strong>cooking and eating</strong>, would like to find out about
of some of the best restaurants in the world, or just want a few choice recipes to add to your
collection, <em>this is the site for you!</em></p>

<p><img src="spoon.gif" alt="spoon illustration"> Your pal, Jen at Jen's Kitchen</p>
<hr>
<p><small>Copyright 2011, Jennifer Robbins</small></p>
</body>
</html>
```

Lesson 2 – How the Web Works – The Anatomy of a Web Page



kitchen.css

```
body { font: normal 1em Verdana; margin: 1em 10%;}
h1 { font: italic 3em Georgia; color: rgb(23, 109, 109); margin: 1em 0 1em;}
img { margin: 0 20px 0 0; }
h1 img { margin-bottom: -20px; }
small { color: #666666; }
```

Figure 2-3. The source file and images that make up a simple web page.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – HTML Documents

You may be as surprised as I was to learn that the graphically rich and interactive pages we see on the Web are generated by simple, text-only documents.

This text file is referred to as the source document.

Take a look at index.html, the source document for the Jen’s Kitchen web page.

You can see it contains the text content of the page plus special tags (indicated with angle brackets, < and >) that describe each element on the page.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – HTML Documents

Adding descriptive tags to a text document is known as “marking up” the document.

Web pages use a markup language called HyperText Markup Language, or HTML for short, which was created especially for documents with hypertext links.

HTML defines dozens of text elements that make up documents such as headings, paragraphs, emphasized text, and of course, links. There are also elements that add information about the document (such as its title), media such as images and videos, and widgets for form inputs, just to name a few

Lesson 2 – How the Web Works – The Anatomy of a Web Page – HTML Documents

It is worth noting briefly that there are actually several versions of HTML in use today.

The most firmly established are HTML version 4.01 and its stricter cousin, XHTML 1.0.

And you may have heard how all the Web is a-buzz with the emerging HTML5 specification that is designed to better handle web applications and is gradually gaining browser support.

I will give you the lowdown on all the various versions and what makes them unique in Chapter 10, What’s Up, HTML5?. In the meantime, we have to cover some basics that apply regardless of the HTML flavor you choose.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – A quick introduction to HTML markup

You'll be learning the nitty-gritty of markup in Part II, so I don't want to bog you down with too much detail right now, but there are a few things I'd like to point out about how HTML works and how browsers interpret it.

Read through the HTML document in Figure 2-3 and compare it to the browser results. It's easy to see how the elements marked up with HTML tags in the source document correspond to what displays in the browser window.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – A quick introduction to HTML markup

First, you’ll notice that the text within brackets (for example, **<body>**) does not display in the final page. The browser displays only what’s between the tags—the content of the element.

The markup is hidden. The tag provides the name of the HTML element—usually an abbreviation such as “h1” for “heading level 1,” or “em” for “emphasized text.”
Second, you’ll see that most of the HTML tags appear in pairs surrounding the content of the element.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – A quick introduction to HTML markup

In our HTML document, **<h1>** indicates that the following text should be a level-1 heading; **</h1>** indicates the end of the heading. Some elements, called empty elements, do not have content. In our sample, the **<hr>** tag indicates an empty element that tells the browser to “insert a thematic divider here” (most browsers indicate the thematic divider with a horizontal rule [line], which is how the **hr** element got its initials)

Lesson 2 – How the Web Works – The Anatomy of a Web Page – A quick introduction to HTML markup

Because I was unfamiliar with computer programming when I first began writing HTML, it helped me to think of the tags and text as “beads on a string” that the browser interprets one by one, in sequence.

For example, when the browser encounters an open bracket (<), it assumes all of the following characters are part of the markup until it finds the closing bracket (>).

Similarly, it assumes all of the content following an opening **<h1>** tag is a heading until it encounters the closing **</h1>** tag. This is the manner in which the browser parses the HTML document. Understanding the browser’s method can be helpful when troubleshooting a misbehaving HTML document.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – But where are the pictures?

Obviously, there are no pictures in the HTML file itself, so how do they get there when you view the final page?

You can see in Figure 2-3 that each image is a separate file. The images are placed in the flow of the text with the HTML image element (**img**) that tells the browser where to find the graphic (its URL).

When the browser sees the **img** element, it makes another request to the server for the image file, and then places it in the content flow. The browser software brings the separate pieces together into the final page. Videos and other embedded media files are added in much the same way.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – But where are the pictures?

The assembly of the page generally happens in an instant, so it appears as though the whole page loads all at once.

Over slow connections or if the page includes huge graphics or media files, the assembly process may be more apparent as images lag behind the text.

The page may even need to be redrawn as new images arrive (although you can construct your pages in a way to prevent that from happening).

Lesson 2 – How the Web Works – The Anatomy of a Web Page – Adding a Little Style

I want to direct your attention to one last key ingredient of our minimal page. Near the top of the HTML document there is a **link** element that points to the style sheet document *kitchen.css*.

That style sheet includes a few lines of instructions for how the page should look in the browser.

These are style instructions written according to the rules of Cascading Style Sheets (CSS).

CSS allows designers to add visual style instructions (known as the document’s presentation) to the marked-up text (the document’s structure, in web design terminology). In Part III, you’ll really get to know the power of Cascading Style Sheets.

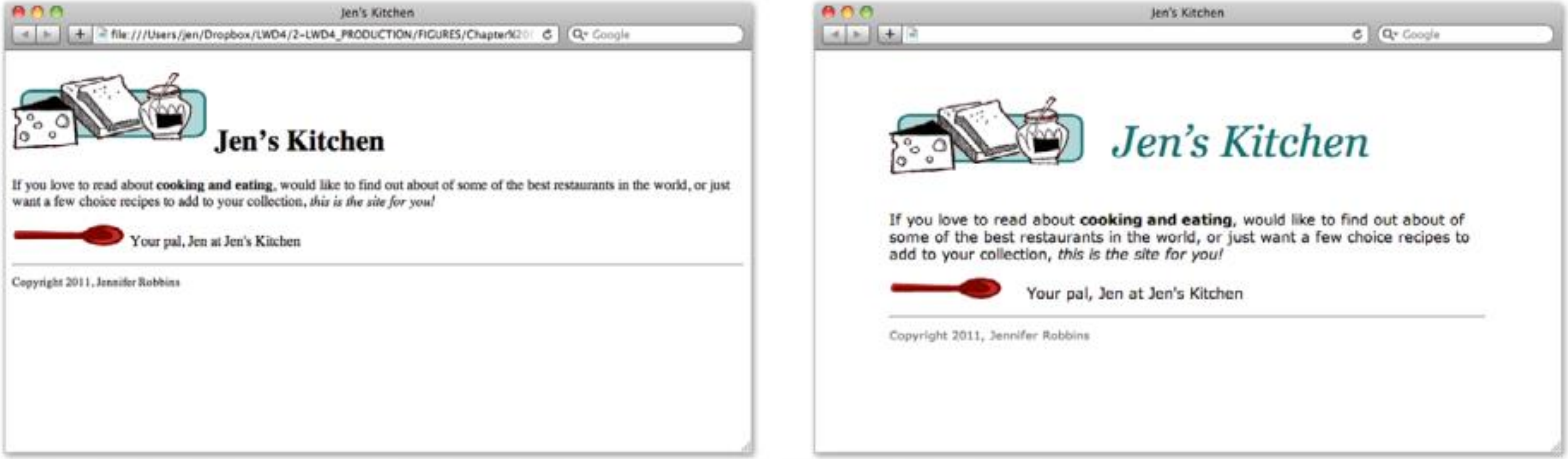
Lesson 2 – How the Web Works – The Anatomy of a Web Page – Adding a Little Style

Figure 2-4 shows the Jen’s Kitchen page with and without the style instructions.

Browsers come equipped with default styles for every HTML element they support, so if an HTML document lacks its own custom style instructions, the browser will use its own (that’s what you see in the screen shot on the right).

Even just a few style rules can make big improvements to the appearance of a page

Lesson 2 – How the Web Works – The Anatomy of a Web Page – Adding a Little Style


Jen's Kitchen
file:///Users/jen/Dropbox/LWD4/2-LWD4_PRODUCTION/FIGURES/Chapter%20
Google
Jen's Kitchen
Google

Jen’s Kitchen

If you love to read about **cooking and eating**, would like to find out about of some of the best restaurants in the world, or just want a few choice recipes to add to your collection, *this is the site for you!*

Your pal, Jen at Jen's Kitchen

Copyright 2011, Jennifer Robbins

Jen’s Kitchen

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Your pal, Jen at Jen's Kitchen

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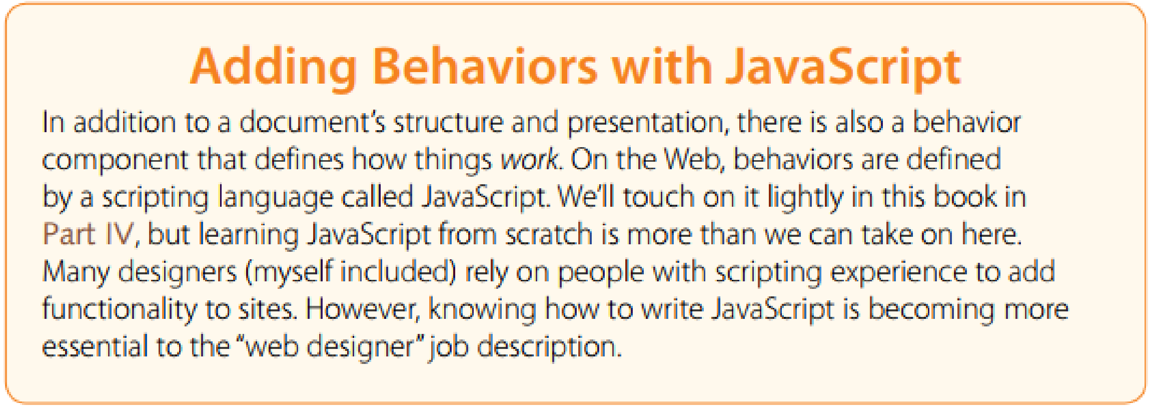
Figure 2-4. The Jen’s Kitchen page before (left) and after (right) style rules.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – Adding Behavior



Adding Behaviors with JavaScript

In addition to a document's structure and presentation, there is also a behavior component that defines how things *work*. On the Web, behaviors are defined by a scripting language called JavaScript. We'll touch on it lightly in this book in Part IV, but learning JavaScript from scratch is more than we can take on here. Many designers (myself included) rely on people with scripting experience to add functionality to sites. However, knowing how to write JavaScript is becoming more essential to the "web designer" job description.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – Putting It All Together

Wrap Up! How the web works, let's trace a typical stream of events that occurs with every web page that appears on your screen (Figure 2-5).

➊ You request a web page by either typing its URL (for example, *http://jenskitchensite.com*) directly in the browser or by clicking on a link on a page.

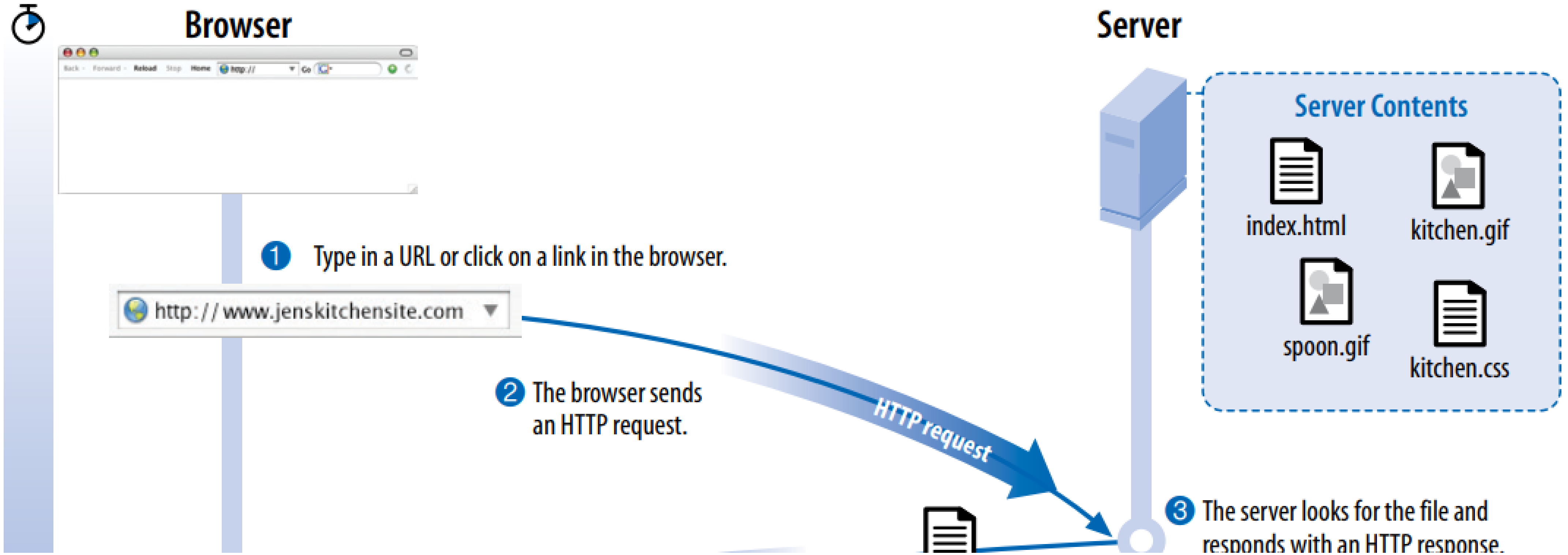
The URL contains all the information needed to target a specific document on a specific web server on the Internet.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – Putting It All Together

➋ Your browser sends an HTTP Request to the server named in the URL
and asks for the specific file.

If the URL specifies a directory (not a file),
it is the same as requesting the default file in that directory.

Lesson 2 – How the Web Works – The Anatomy of a Web Page – Putting It All Together – Steps 1 and 2



1 Type in a URL or click on a link in the browser.

2 The browser sends an HTTP request.

3 The server looks for the file and responds with an HTTP response.

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❸ The server looks for the requested file and issues an HTTP response.

a. If the page cannot be found, the server returns an error message. The message typically says “404 Not Found,” although more hospitable error messages may be provided.

b. If the document *is* found, the server retrieves the requested file and returns it to the browser.

❹ The browser parses the HTML document. If the page contains images (indicated by the HTML **img** element) or other external resources like scripts, the browser contacts the server again to request each resource specified in the markup.

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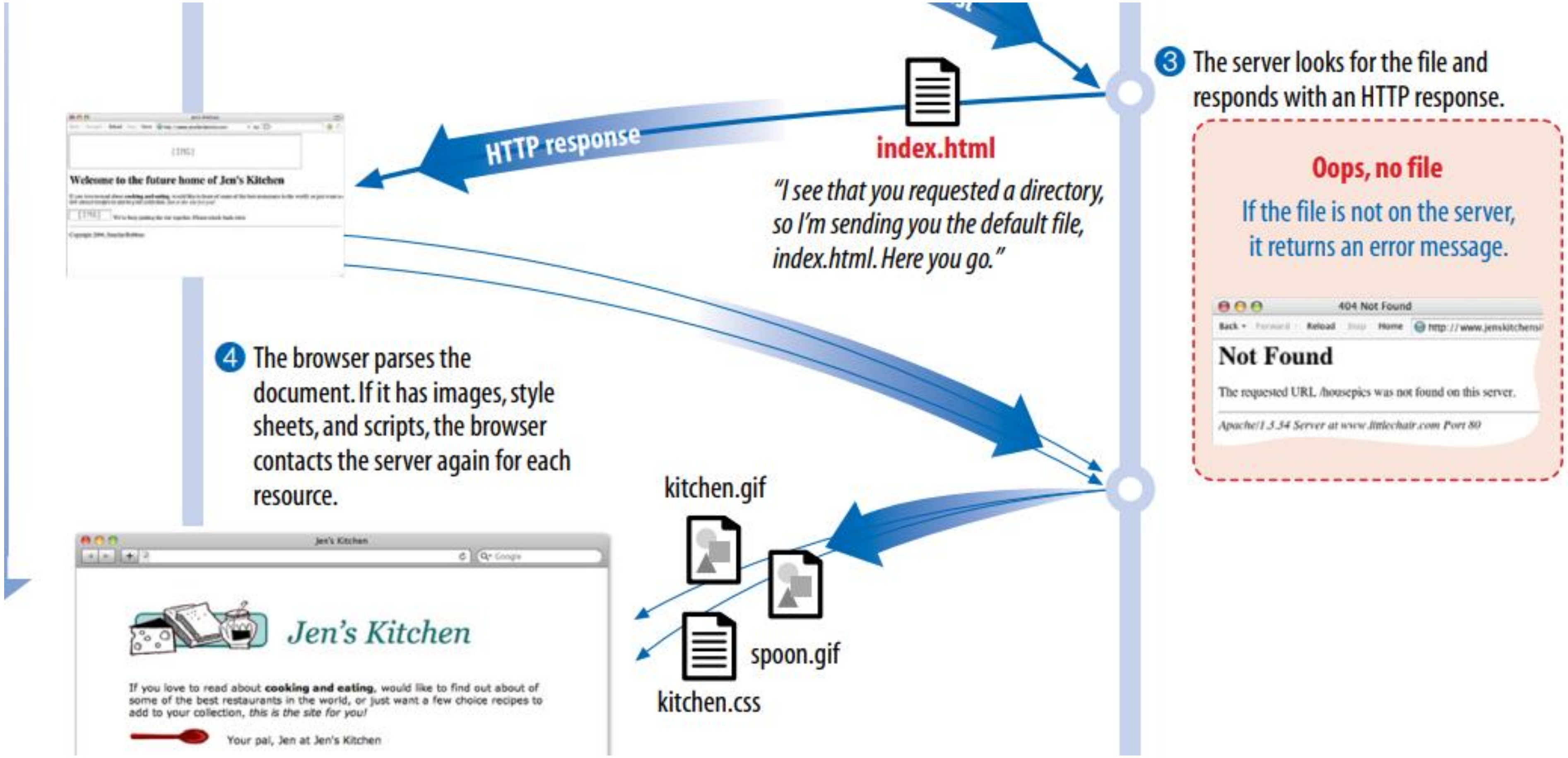

③ The server looks for the file and responds with an HTTP response.

"I see that you requested a directory, so I'm sending you the default file, index.html. Here you go."

Oops, no file

If the file is not on the server, it returns an error message.

Not Found

The requested URL /housepics was not found on this server.

Apache/1.3.34 Server at www.littlechair.com Port 80

④ The browser parses the document. If it has images, style sheets, and scripts, the browser contacts the server again for each resource.

If you love to read about **cooking and eating**, would like to find out about of some of the best restaurants in the world, or just want a few choice recipes to add to your collection, *this is the site for you!*

Your pal, Jen at Jen's Kitchen

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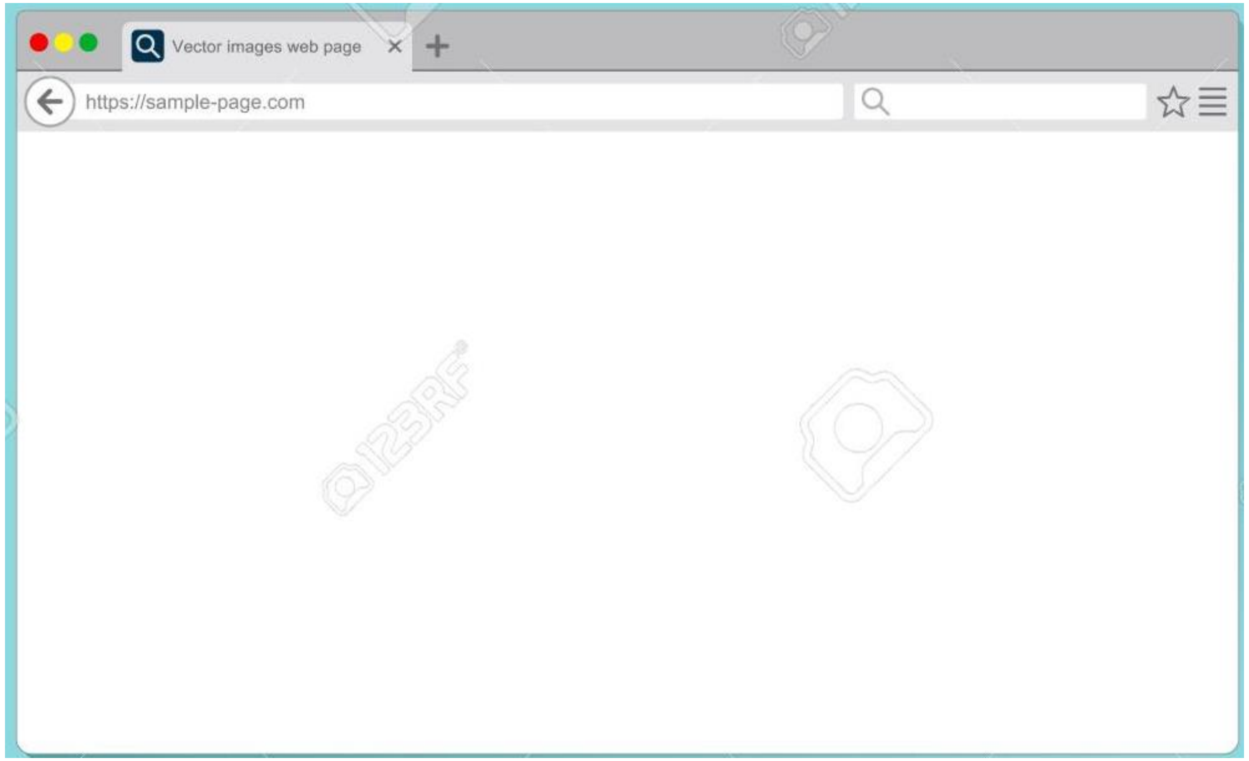
❺ The browser inserts each image in the document flow where indicated by the **img** element.

And *voila*!

The assembled web page is displayed for your viewing pleasure.



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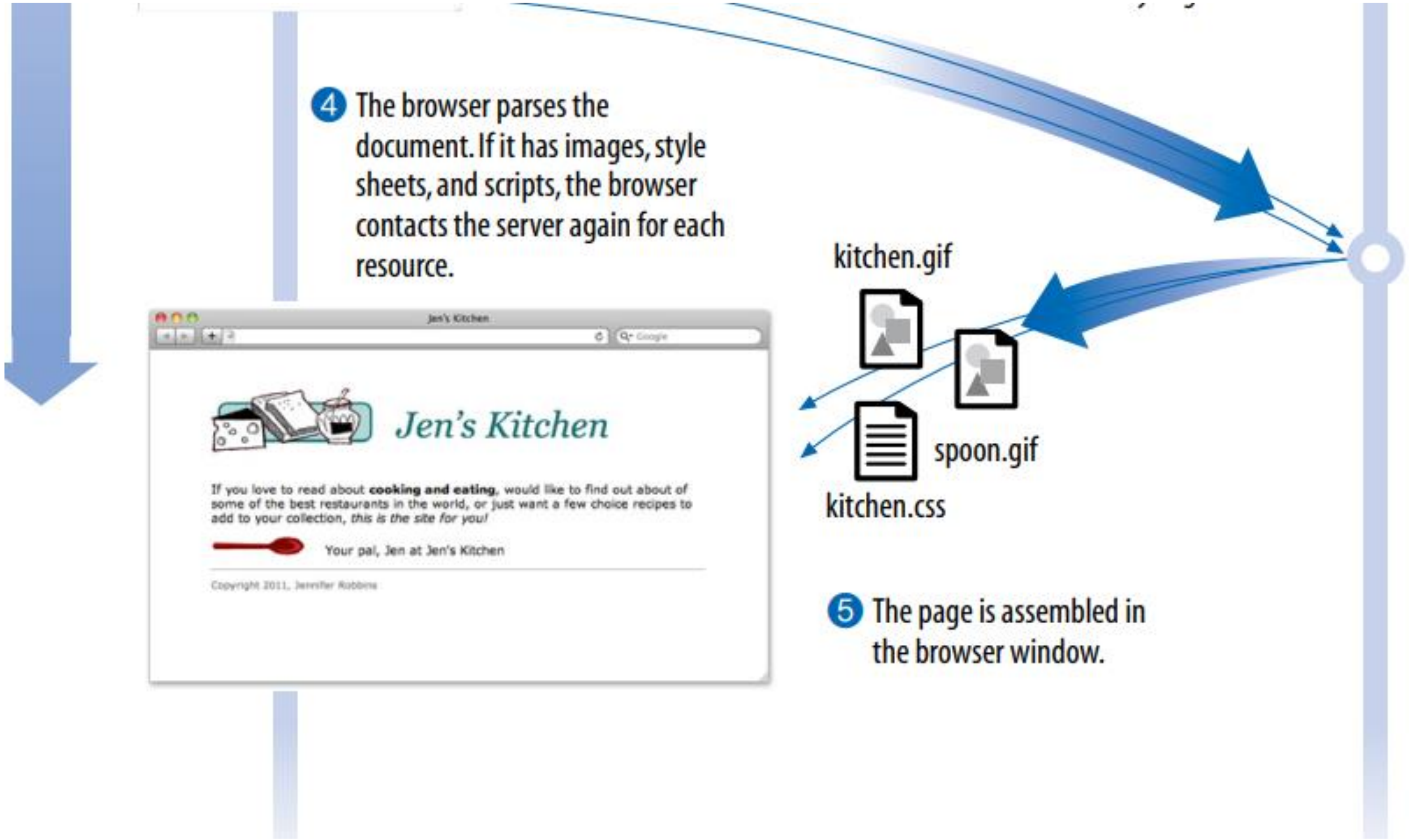

4 The browser parses the document. If it has images, style sheets, and scripts, the browser contacts the server again for each resource.

Jen's Kitchen

Jen's Kitchen

If you love to read about **cooking and eating**, would like to find out about of some of the best restaurants in the world, or just want a few choice recipes to add to your collection, *this is the site for you!*

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5 The page is assembled in the browser window.

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