

Universal Resource Locator (URL)

Mendel Rosenblum

Hypertext

- Text with **links** to other text
 - Click on links takes you somewhere else
 - Old idea:
 - Ted Nelson coined the term (early '60s), built Xanadu system
 - Doug Englebart: "Mother of all demos" in 1968
 - HyperCard for the Macintosh: 1987
- Web adapted the idea, link specification:
 - **Uniform Resource Locators (URL)** - Provided **names** for web content

```
<a href="https://en.wikipedia.org/wiki/URL">URL</a>
```

Parts of an URL

<http://host.company.com:80/a/b/c.html?user=Alice&year=2008#p2>

Scheme (**http:**): identifies protocol used to fetch the content.

Host name (**host.company.com**): name of a machine to connect to.

Server's port number (**80**): allows multiple servers to run on the same machine.

Hierarchical portion (**/a/b/c.html**): used by server to find content.

Query parameters (**?user=Alice&year=2008**): provides additional parameters

Fragment (**#p2**): Have browser scroll page to fragment (html: **p2** is anchor tag)

Used on the browser only; not sent to the server.

URL: schemes (e.g. http)

http: is the most common scheme; it means use the HTTP protocol

https: is similar to http: except that it uses SSL encryption

file: means read a file from the local disk

websocket: means create a TCP connection

mailto: means open an email program composing a message

There are many (~350) other schemes: <https://www.iana.org/assignments/uri-schemes/>

Example: **mongodb**: points to a MongoDB database

URL: Hierarchical portion (/a/b/c.html)

- Passed to the web server for interpretation. Early web servers:
 - Path name for a static HTML file.
 - Path name of a program that will generate the HTML content (e.g., foo.php).
- Web server programmed with **routing** information
 - Map hierarchical position to function to be performed and possibly the function's parameters
- Application Programming Interface (API) design, Example:
 - /user/create
 - /user/list
 - /user/0x23490
 - /user/0x23433
 - /user/delete/0x23433

Query Parameters (e.g. ?user=Alice&year=2008)

- Traditionally has been to provide parameters to operation:

`http://www.company.com/showOrder.php?order=4621047`

- For modern apps has implications of when the browser switches pages

Links

- Browser maintains a notion of current location (i.e. URL)
- Links: content in a page which, when clicked on, causes the browser to go to URL
- Links are implemented with the `<a>` tag:

```
<a href="http://www.company.com/news/2009.html">2009 News</a>
```

Different types of links

Full URL: `2009 News`

Absolute URL: ``
same as `http://www.xyz.com/stock/quote.html`

Relative URL (intra-site links): ``
same as `http://www.xyz.com/news/2008/March.html`

Define an anchor point (a position that can be referenced with # notation):

``

Go to a different place in the same page: ``

Uses of URLs

- Loading a page: type the URL into your browser

- Load a image:

```

```

- Load a stylesheet:

```
<link rel="stylesheet" type="text/css" href="...">
```

- Embedded a page:

```
<iframe src="http://www.google.com">
```

URL Encoding

- What if you want to include a punctuation character in a query value?

`http://www.stats.com/companyInfo?name=C&H Sugar`

- Any character in a URL other than A-Z, a-z, 0-9, or any of `-_.` must be represented as `%xx`, where `xx` is the hexadecimal value of the character:

`http://www.stats.com/companyInfo?name=C%26H%20Sugar`

- Escaping is a commonly used technique and also a source of errors

Miscellaneous Topics

- Computer scientists take on hypertext:
Need to have **referential integrity**
- The web (done by physicists):
Error 404
- URI (Uniform Resource Identifier) vs. URL (Uniform Resource Locator)

Sample Exam Question

Given a HTML document loaded from the URL:

```
file:///Users/mendel/index.html
```

That contains the element in its head section

```
<link rel="stylesheet" type="text/css" href="CS142 Project #1/styleA.css?ref=v1" />
```

Explain why the fetched URL is: `file:///Users/mendel/CS142%20Project%20`

and the browser reports:

A screenshot of a browser error message. The message is displayed in a light red background. On the left, there is a red 'x' icon followed by the text "Failed to load resource: net::ERR_FILE_NOT_FOUND". On the right, the URL "CS142%20Project%20#1/styleA.css?ref=v1:1" is shown in red text and underlined.

✖ Failed to load resource: net::ERR_FILE_NOT_FOUND CS142%20Project%20#1/styleA.css?ref=v1:1