Fun with ...

curl://

Greg Horie

What is cURL?

- cURL = Client URL.
- Both an open source software library (libcurl) and command-line tool (curl).
    - First released in 1997.
- Compatible with both IPv4 and IPv6.
- Transfers data through various network protocols.
    - HTTP most commonly used.
- Many excellent features:
    - For HTTP, supports TLS and certificate validation.
    - Supports HTTP methods and header manipulation.
    - Multiple file transfers possible in a single command.
    - Proxy support.
    - Max/min transfer rate settings.
    - Etc.

cURL Protocol Support

DICT	FILE	FTP
FTPS	GOPHER	HTTP
HTTPS	IMAP	IMAPS
LDAP	POP3	RTMP
RTSP	SCP	SFTP
SMB	SMBS	TELNET
TFTP		

A Brief History of HTTP - v/0.9

HTTP = Hypertext Transfer Protocol

- One of the most ubiquitous application protocols on the Internet.
  - Main protocol used in our browsers and for many APIs.

HTTP/0.9 - 1991

- Very basic client-server, request-response protocol.
- Client request is a single ASCII character string.
- Server response is an ASCII character stream.
- Runs over a TCP/IP connection.
- Designed to transfer hypertext documents (HTML).
- The connection between server and client is closed after every request.

A Brief History of HTTP - v/1.0

HTTP/1.0 - 1996

- 1991 -1996
  - Web browsers emerged as the common interface to the Internet.
  - Internet growth boomed during this period.
- In May 1996, the HTTP Working Group (HTTP-WG) published RFC 1945.
  - Extended the list of HTTP methods and HTTP headers.
  - Retained ASCII encoding.
  - Response prefixed with a status line.
  - May transfer other documents in the response - Not limited to HTML.
  - Still adheres to 1 connect / disconnect per request / response.

A Brief History of HTTP - v/1.1 and v/2.0

HTTP/1.1 - 1997

- Still in wide use today.
- In Jan 1997, RFC 2068 released for HTTP/1.1.
  - More improvements in June 1999 with RFC 2616.
- Improvements made:
  - Request includes content-type, encoding, character set, and cookie metadata.
  - Performance improvements - Chunked responses and connection reuse.

HTTP/2.0 - 2012

- Focuses on improving transport performance, low latency, and higher throughput.
- Binary stream rather than text.
- Fully multiplexed - multiple file requests in parallel over a single connection.
- No significant change to protocol semantics - i.e. headers, methods, etc.

Lab Prep

Ubuntu 18.04 / 20.04

```
$ sudo apt update
$ sudo apt install curl
```

CentOS 7

```
$ sudo yum check-update
$ sudo yum install curl
```

Other Operating Systems

https://curl.haxx.se/download.html

Exercise - Basic cURL usage

Try:

```
$ curl http://vicpimakers.ca

$ curl http://vicpimakers.ca --location

$ curl http://vicpimakers.ca --location --head

$ curl http://vicpimakers.ca --location --head --verbose

$ curl http://vicpimakers.ca --location --head --verbose \
       --trace debug.out
```

Basic cURL usage - Discussion

- What is the difference between these 5 invocations of the curl command?
- Why do we have all these redirects?
- How are these different commands useful?

Exercise - Save URL to File

Try:

```
$ curl https://vicpimakers.ca -o vicpimakers_ca.html

$ curl -O https://vicpimakers.ca

$ curl -O https://vicpimakers.ca/robots.txt
```

Save URL to File - Discussion

- What did each of these commands do?
- Was there anything wrong? How do we fix it?
- Can we use curl to crawl a site?
    - Not without some effort. Instead try:

```
$ wget --spider --recursive vicpimakers.ca
```

Exercise - Explore HTTP Methods

Try:

```
$ curl --request GET https://vicpimakers.ca

$ curl --request POST https://vicpimakers.ca

$ curl --request HEAD https://vicpimakers.ca

$ curl --request POST \
       --data 'url=https%3A%2F%2Fvicpimakers.ca' \
       'https://cleanuri.com/api/v1/shorten'
```

HTTP Methods - Discussion

- Any problems? What did you find?
- HTTP methods enable actions on a given "resource".
  - Popular for RESTful APIs.

Method	**Typical Action**
GET	Retrieve resource data.
POST	Submit an entity (e.g. form or record) to the specified resource. Often leads to a change of state (e.g. insert record to database).
HEAD	Asks for response similar to GET, but without the response body.
PUT	Replaces the target resource with the request payload.
DELETE	Deletes the specified resource.

HTTP Methods - Developer Tip

- cURL and RESTful JSON data can be a challenge.
- Consider HTTPie instead for this use case.

```
$ pip install httpie

$ http -v httpbin.org/post hello=World
```

vs.

```
$ curl -v -X POST httpbin.org/post -d '{"hello": "world"}'
```

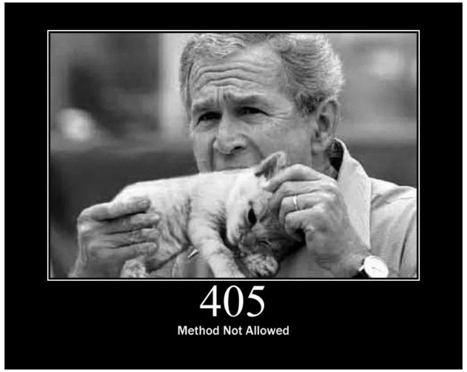
- Or switch to an appropriate language - e.g. python.

Exercise - Explore Status Codes

Try:

```
$ curl -Is https://www.twitter.com -L | grep HTTP/

$ curl -s -o /dev/null -w "%{http_code}" \
       -L https://www.twitter.com
```



https://boingboing.net/2011/12/14/http-status-cats-by-girliemac.html

Exercise - Discussion

- Any questions?

Status Codes	**Meaning**
1xx	Informational Response. Request received and understood. Request processing continues.
2xx	Success. Requested action was successful. e.g. 200 - OK.
3xx	Redirection. Client must take further action to complete request. e.g. 301 - Moved Permanently.
4xx	Client errors. Request contains syntax errors or cannot be fulfilled. e.g. 404 - Not Found.
5xx	Server errors. Server encountered an error - cannot fulfill request. e.g. 500 - Internal Server Error.

Exercise - Explore Request Headers

Try:

```
$ curl http://nghttp2.org -I -L -v

$ curl http://nghttp2.org -I -L -v --http2
```

Headers - Discussion

- What did you find?
- You can further manipulate request headers with the curl -H (--header) option.
    - Not to be mistaken with the curl -I (--head) option.
- https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers

Exercise - FTP

Try:

```
$ head -c 5MB /dev/urandom > randofile.bin

$ curl --user anonymous:anonymous \
       --upload-file randofile.bin \
       ftp://speedtest.tele2.net/upload/

$ curl --user anonymous:anonymous \
       ftp://speedtest.tele2.net/

$ curl --user anonymous:anonymous \
       -O ftp://speedtest.tele2.net/5MB.zip
```

Exercise - Fun with Dict

Try:

```
$ curl dict://dict.org/d:curl
```

```
# Maybe something for your .bashrc
$ alias dict='function _dict(){ curl " dict://dict.org/d:${1}"; }; _dict'
$ dict curl
```

Exercise - Fun Sites with cURL

Try:

```
$ curl wttr.in
$ alias wttr='function _wttr(){ curl "wttr.in/${1}"; }; _wttr'
$ wttr
$ wttr toronto
$ wttr moon

$ curl qrenco.de/https://vicpimakers.ca

$ curl https://asciitv.fr

# So much fun!
```

Summary

- cURL is an excellent tool for CLI interactions with Internet resources.
- Commonly used with HTTP, but it supports many other protocols.
- If you're not using it, consider adding cURL to your toolbox.

VicPiMakers Communications

- Please let us know if want to be in our VicPiMakers Slack group and/or mailing list.

Backup Slides