

Internet e architetture di rete

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La ragazza della porta ottanta: HTTP



TCP / UDP 80



[Tim_Berners_Lee]



URI

HTML

HTTP

URL



Tim Berners-Lee, inventore del World Wide Web

[RFC 1630, 1738, 1866, 1945, 2068, 2396, 2616, 3986]



maggió 1996

Hypertext Transfer Protocol -- HTTP/1.0

[RFC 1945]



giugno 1999

Hypertext Transfer Protocol -- HTTP/1.1

[RFC 2616]



RFC 1945

HTTP has been in use by the World-Wide Web global information initiative **since 1990**. This specification reflects common usage of the protocol referred to as "HTTP/1.0".



Universal Resource Identifier

URI ASSOLUTO

scheme://hostname[:port]/path

http://www.paperino.it:80/qui/quo/qua

REFURTO

URI RELATIVO

/qui

/qui/quo

/qui/quo/qua



Uniform Resource Locator

http_URL = "http://"host[:port][abs_path]

HTTP message types

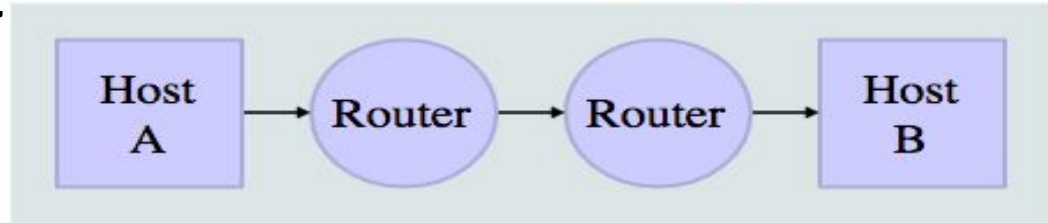
HTTP messages consist of requests from client to server and responses from server to client.



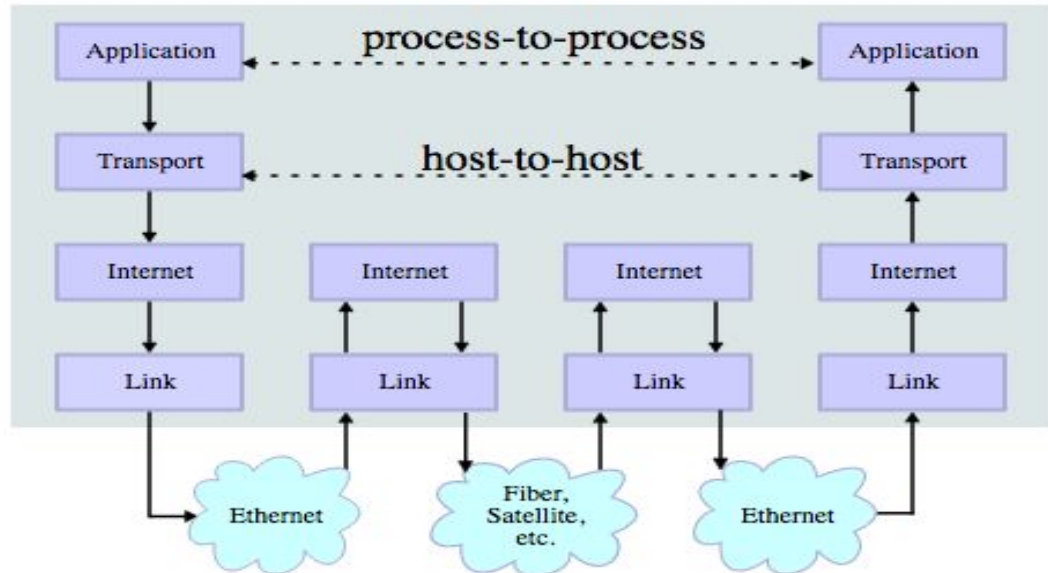
Il WEB server è un HTTP server

Protocollo a
livello applicativo

Network Topology



Data Flow



1.^o Il client fa una domanda



HTTP SERVER

2. Il server risponde



TCP 80

Il protocollo HTTP supporta più scambi domanda/risposta su una singola sessione TCP



Domanda HTTP 1.0

Righe di testo (ASCII)

Fine riga con CRLF \r\n

Prima riga: Request-Line

Request-Line
Intestazioni
Riga vuota
Contenuto



GET recupera informazioni indicate dalla URI **anda**

HEAD recupera meta-informazioni sulla URI

POST invia informazioni alla URI e recupera il risultato

PUT Archivia informazioni nel posto nominato dalla URI

DELETE rimuove l'entità indicata dalla URI

TRACE traccia HTTP inoltrato attraverso proxy, tunnel ecc

OPTIONS determina le capacità del server o le caratteristiche di una risorsa



telnet as59715.net 80

Trying 2a02:cdc5:9715:1:250:56ff:fe97:2298...

Connected to as59715.net.

Escape character is '^'].

GET / HTTP/1.1

Host: as59715.net

[CRLF]

HTTP/1.1 301 Moved Permanently

Date: Sat, 28 May 2016 04:49:11 GMT

Server: Apache/2.4.20 (FreeBSD) OpenSSL/1.

0.1e-freebsd PHP/5.4.45

Location: <https://as59715.net/>

Content-Length: 228

Content-Type: text/html; charset=iso-8859-1

Telnet LAB

```
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
```

```
<html><head>
```

```
<title>301 Moved Permanently</title>
```

```
</head><body>
```

```
<h1>Moved Permanently</h1>
```

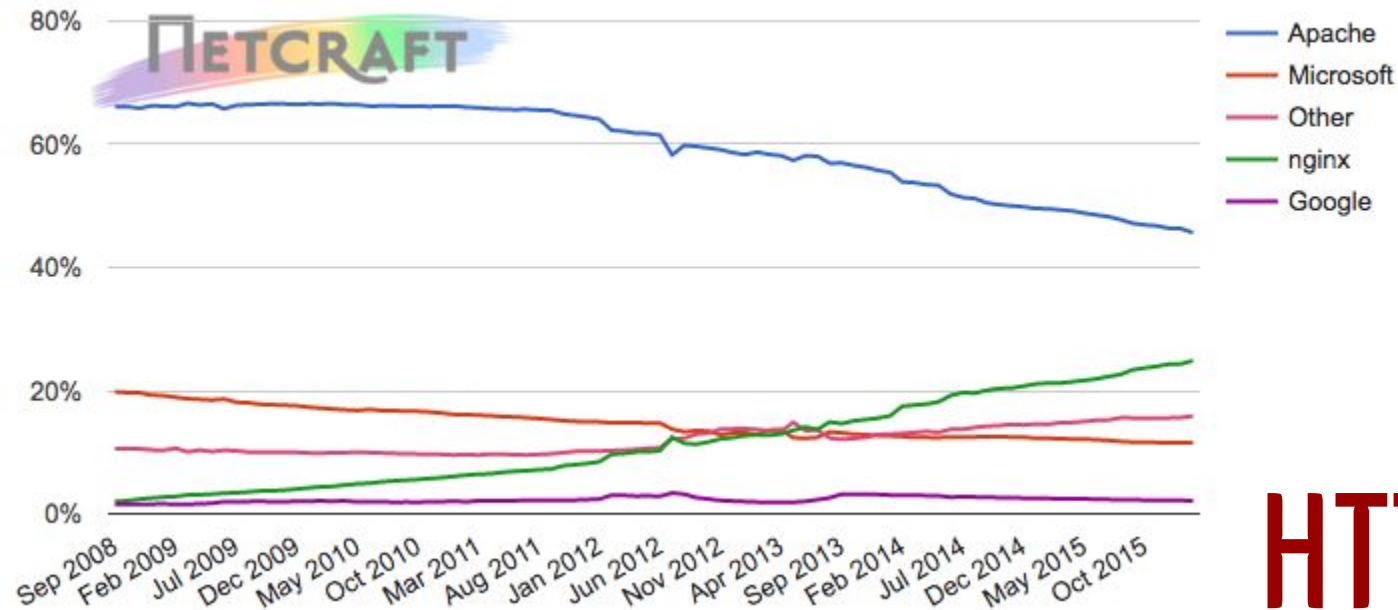
```
<p>The document has moved <a href="https://as59715.net/">here</a>.</p>
```

```
</body></html>
```

```
Connection closed by foreign host.
```



Web server developers: Market share of the top million busiest sites



HTTP server

Developer	January 2016	Percent	February 2016	Percent	Change
Apache	463,092	46.31%	456,483	45.65%	-0.66
nginx	243,340	24.33%	248,627	24.86%	0.53
Microsoft	115,358	11.54%	115,447	11.54%	0.01
Google	21,824	2.18%	21,008	2.10%	-0.08



HTTP server LAB

Installa *lighttpd*

Redhat [e derivati]

```
yum install lighttpd
```

Debian [e derivati]

```
apt-get install lighttpd
```

FreeBSD

```
pkg install lighttpd
```

A

Localizza e modifica il file *lighttpd.conf*

Redhat e Debian

```
/etc/lighttpd/lighttpd.conf
```

FreeBSD

```
/usr/local/etc/lighttpd/lighttpd.conf
```

B

Avvia il demone *lighttpd*

Redhat e Debian

```
systemctl start lighttpd.service
```

FreeBSD

```
echo 'lighttpd_enable=YES' >> /etc/rc.conf && /usr/local/etc/rc.d/lighttpd start
```

C



HTTP server LAB

Redhat [e derivati]

Debian [e derivati]

FreeBSD

```
yum install lighttpd
```

```
apt-get install lighttpd
```

```
pkg install lighttpd
```

Installa *lighttpd*

```
apt-get install lighttpd
```

```
Reading package lists... Done
```

```
Building dependency tree
```

```
Reading state information... Done
```

```
Suggested packages:
```

```
  rrdtool apache2-utils
```

```
The following NEW packages will be installed:
```

```
  lighttpd
```

```
0 upgraded, 1 newly installed, 0 to remove and 3 not upgraded.
```

```
Need to get 0 B/227 kB of archives.
```

```
After this operation, 915 kB of additional disk space will be used.
```

```
Selecting previously unselected package lighttpd.
```

```
(Reading database ... 203113 files and directories currently installed.)
```

```
Preparing to unpack .../lighttpd_1.4.33-1+nmu2ubuntu2_amd64.deb ...
```

```
Unpacking lighttpd (1.4.33-1+nmu2ubuntu2) ...
```

```
Processing triggers for ufw (0.34-rc-0ubuntu2) ...
```

```
Processing triggers for ureadahead (0.100.0-16) ...
```

```
ureadahead will be reprofiled on next reboot
```

```
Processing triggers for man-db (2.6.7.1-1ubuntu1) ...
```

```
Setting up lighttpd (1.4.33-1+nmu2ubuntu2) ...
```

```
* Starting web server lighttpd
```



HTTP server LAB

Localizza e modifica il file *lighttpd.conf*

Redhat e Debian
FreeBSD

/etc/lighttpd/lighttpd.conf

/usr/local/etc/lighttpd/lighttpd.conf

```
server.document-root = "/var/www"  
server.upload-dirs   = ( "/var/cache/lighttpd/uploads" )  
server.errorlog      = "/var/log/lighttpd/error.log"  
server.pid-file      = "/var/run/lighttpd.pid"  
server.username      = "www-data"  
server.groupname     = "www-data"  
server.port          = 80
```



HTTP server LAB

Avvia il demone *lighttpd*

Redhat e Debian

```
systemctl start lighttpd.service
```

FreeBSD

```
echo 'lighttpd_enable=YES' >> /etc/rc.conf && /usr/local/etc/rc.d/lighttpd start
```

Verifica che *lighttpd* stia ascoltando sulla porta TCP 80

```
netstat -an|grep lighttpd
```

```
tcp      0      0 0.0.0.0:80          0.0.0.0:*          LISTEN   3893/lighttpd
```



telnet localhost 80

Trying 127.0.0.1...

Connected to localhost.

Escape character is '^['.

GET / HTTP/1.1

Host: localhost

HTTP/1.1 200 OK

Vary: Accept-Encoding

Content-Type: text/html

Accept-Ranges: bytes

ETag: "3446712510"

Last-Modified: Sat, 28 May 2016 03:39:13 GMT

Content-Length: 3568

Date: Sat, 28 May 2016 04:58:07 GMT

Server: lighttpd/1.4.33

Telnet LAB



BROWSER LAB

Placeholder page

The owner of this web site has not put up any web pages yet. Please come back later.

You should replace this page with your own web pages as soon as possible.

Unless you changed its configuration, your new server is configured as follows:

- * Configuration files can be found in /etc/lighttpd. Please read /etc/lighttpd/conf-available/README file.
- * The DocumentRoot, which is the directory under which all your HTML files should exist, is set to /var/www.
- * CGI scripts are looked for in /usr/lib/cgi-bin, which is where Ubuntu packages will place their scripts. You can enable cgi module by using command "lighty-enable-mod cgi".
- * Log files are placed in /var/log/lighttpd, and will be rotated weekly. The frequency of rotation can be easily changed by editing /etc/logrotate.d/lighttpd.
- * The default directory index is index.html, meaning that requests for a directory /foo/bar/ will give the contents of the file /var/www/foo/bar/index.html if it exists (assuming that /var/www is your DocumentRoot).
- * You can enable user directories by using command "lighty-enable-mod userdir"

About this page

This is a placeholder page installed by the Ubuntu release of the **Lighttpd server package**.

This computer has installed the Ubuntu operating system, but it has nothing to do with the Ubuntu Project. Please do not contact the Ubuntu Project about it.

If you find a bug in this Lighttpd package, or in Lighttpd itself, please file a bug report on it. Instructions on doing this, and the list of known bugs of this package, can be found in the **Ubuntu Bug Tracking System**.

Valid XHTML 1.0 Transitional

<http://packages.ubuntu.com/lighttpd>

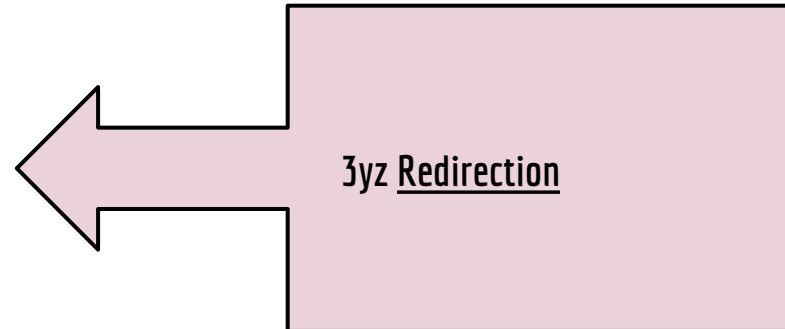
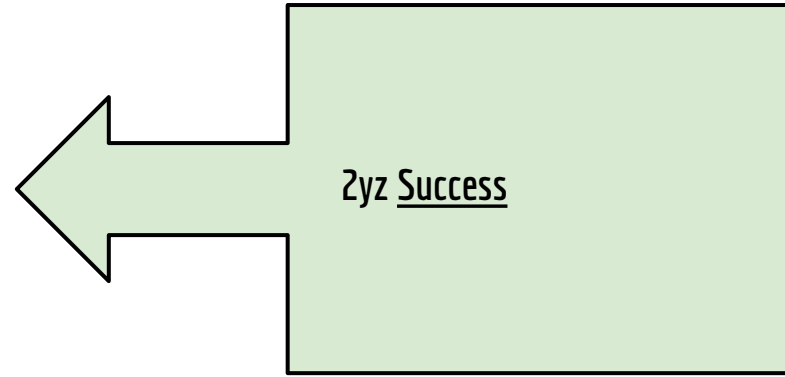
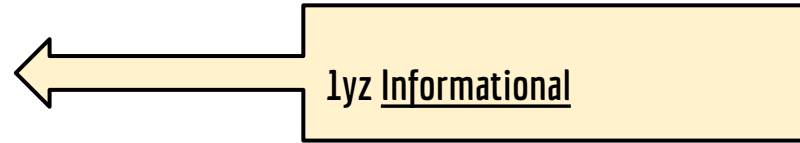


HTTP, codici di stato: 1yz, 2yz, 3yz

100 Continue
101 Switching Protocols
102 Processing

200 OK
201 Created
202 Accepted
203 Non-authoritative Information
204 No Content
205 Reset Content
206 Partial Content
207 Multi-Status
208 Already Reported
226 IM Used

300 Multiple Choices
301 Moved Permanently
302 Found
303 See Other
304 Not Modified
305 Use Proxy
307 Temporary Redirect
308 Permanent Redirect



HTTP, codici di stato: 4yz

400 Bad Request	426 Upgrade Required
401 Unauthorized	428 Precondition Required
402 Payment Required	429 Too Many Requests
403 Forbidden	431 Request Header Fields Too Large
404 Not Found	444 Connection Closed Without Response
405 Method Not Allowed	451 Unavailable For Legal Reasons
406 Not Acceptable	499 Client Closed Request
407 Proxy Authentication Required	
408 Request Timeout	
409 Conflict	
410 Gone	
411 Length Required	
412 Precondition Failed	
413 Payload Too Large	
414 Request-URI Too Long	
415 Unsupported Media Type	
416 Requested Range Not Satisfiable	
417 Expectation Failed	
418 I'm a teapot	
421 Misdirected Request	
422 Unprocessable Entity	
423 Locked	
424 Failed Dependency	



4yz Client error



HTTP, codici di stato: 5yz

500 Internal Server Error
501 Not Implemented
502 Bad Gateway
503 Service Unavailable
504 Gateway Timeout
505 HTTP Version Not Supported
506 Variant Also Negotiates
507 Insufficient Storage
508 Loop Detected
510 Not Extended
511 Network Authentication Required
599 Network Connect Timeout Error



5yz Server error



maggio 2000

HTTP over TLS

[RFC 2818]



TCP / UDP 443



[Kipp_E_B_Hickman]



```
openssl s_client -connect as59715.net:443
```

```
CONNECTED(00000003)
```

```
depth=1 /C=US/O=Let's Encrypt/CN=Let's Encrypt Authority X3
```

```
verify error:num=20:unable to get local issuer certificate
```

```
verify return:0
```

```
---
```

```
Certificate chain
```

```
0 s:/CN=as59715.net
```

```
i:/C=US/O=Let's Encrypt/CN=Let's Encrypt Authority X3
```

```
1 s:/C=US/O=Let's Encrypt/CN=Let's Encrypt Authority X3
```

```
i:/O=Digital Signature Trust Co./CN=DST Root CA X3
```

```
---
```

```
[...]
```

```
GET / HTTP/1.1
```

```
Host: as59715.net
```

```
[CRLF]
```

Telnet LAB

```
HTTP/1.1 200 OK
```

```
Date: Sun, 21 May 2016 16:27:11 GMT
```

```
Server: Apache/2.4.20 (FreeBSD) OpenSSL/1.0.1e-freebsd PHP/5.
```

```
4.45
```

```
X-Powered-By: PHP/5.4.45
```

```
Last-Modified: Thu, 01 Jan 1970 00:00:00 GMT
```

```
Transfer-Encoding: chunked
```

```
Content-Type: text/html
```



maggio 2015

Hypertext Transfer Protocol Version 2 (HTTP/2) [RFC 7540]



RFC 7540

HTTP/2 enables a **more efficient** use of network resources and a reduced perception of latency by introducing header field compression and allowing **multiple concurrent exchanges** on the same connection



Verificare il supporto di HTTP/2

<https://tools.keycdn.com/http2-test>

```
nghttp -vn https://www.prado.it/grep -A 4 NPN
```

```
[ 0.068][NPN] server offers:
```

- * h2
- * spdy/3.1
- * http/1.1

The negotiated protocol: h2





Questions?

