

# Sieci Komputerowe

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# Warstwy

## Model ISO-OSI

- ▶ Warstwa fizyczna
- ▶ Warstwa łącza danych
- ▶ Warstwa sieci
- ▶ Warstwa transportowa
- ▶ **Warstwa sesji**
- ▶ **Warstwa prezentacji**
- ▶ **Warstwa aplikacji**

## TCP/IP

- ▶ Warstwa dostępu do sieci
- ▶ Warstwa internetu
- ▶ Warstwa transportowa
- ▶ **Warstwa aplikacji**

# Jak działa HTTP?

# URL

## Przykład

`http://www.example.com/index.html`

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`http://www.example.com/index.html`

## Przykład 2

`https://user:pass@example.com:8080/do.cgi?a=b&c=d#head`

# URL

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```
http://www.example.com/index.html
```

## Przykład 2

```
https://user:pass@example.com:8080/do.cgi?a=b&c=d#head
```

## Python

```
urllib
```



# URL

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http://www.example.com/index.html
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## Przykład 2

```
https://user:pass@example.com:8080/do.cgi?a=b&c=d#head
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## Python

```
urllib
```

```
parse: urlparse, urlunparse, quote, unquote, urlencode
```

# URL

## Przykład

```
http://www.example.com/index.html
```

## Przykład 2

```
https://user:pass@example.com:8080/do.cgi?a=b&c=d#head
```

## Python

```
urllib
```

```
parse: urlparse, urlunparse, quote, unquote, urlencode
```

```
request: urlopen
```



# URL

```
>>> from urllib.parse import urlparse
>>> urlparse("scheme://netloc/path;parameters?query#fragment")
ParseResult(scheme='scheme', netloc='netloc', path='/path;parameters', params='',
            query='query', fragment='fragment')
>>> o = urlparse("http://docs.python.org:80/3/library/urllib.parse.html?"
...             "highlight=params#url-parsing")
>>> o
ParseResult(scheme='http', netloc='docs.python.org:80',
            path='/3/library/urllib.parse.html', params='',
            query='highlight=params', fragment='url-parsing')
>>> o.scheme
'http'
>>> o.netloc
'docs.python.org:80'
>>> o.hostname
'docs.python.org'
>>> o.port
80
>>> o._replace(fragment="").geturl()
'http://docs.python.org:80/3/library/urllib.parse.html?highlight=params'
```

źródło: docs.python.org



# HTTP/0.9

## Request

GET /index.html

# HTTP/0.9

## Request

```
GET /index.html
```

## Response

```
<!DOCTYPE html>  
<html>  
  <head>  
    <meta charset="utf-8">  
  </head>  
  <body>  
    <div>Hello World!</div>  
  </body>  
</html>
```

# HTTP/1.0

`http://www.w3.org/Protocols/HTTP/1.0/spec.html`  
`https://tools.ietf.org/html/rfc1945,`

## Request

```
GET /index.html HTTP/1.0  
User-Agent: browser
```

# HTTP/1.0

`http://www.w3.org/Protocols/HTTP/1.0/spec.html`  
`https://tools.ietf.org/html/rfc1945,`

## Request

```
GET /index.html HTTP/1.0
User-Agent: browser
```

## Response

```
HTTP/1.0 200 OK
Server: server
Content-Type: text/html; charset=utf-8
```

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
  </head>
  <body>
    <div>Hello World!</div>
  </body>
</html>
```



# HTTP/1.0 - metody

- ▶ GET
- ▶ HEAD
- ▶ POST

# HTTP/1.0 - nagłówki

- ▶ Date
- ▶ Pragma

# HTTP/1.0 - nagłówki

- ▶ Date
- ▶ Pragma
- ▶ Authorization
- ▶ From
- ▶ If-Modified-Since
- ▶ Referer
- ▶ User-Agent



# HTTP/1.0 - nagłówki

- ▶ Date
- ▶ Pragma
- ▶ Authorization
- ▶ From
- ▶ If-Modified-Since
- ▶ Referer
- ▶ User-Agent
- ▶ Location
- ▶ Server
- ▶ WWW-Authenticate

# HTTP/1.0 - nagłówki

- ▶ Date
- ▶ Pragma
- ▶ Authorization
- ▶ From
- ▶ If-Modified-Since
- ▶ Referer
- ▶ User-Agent
- ▶ Location
- ▶ Server
- ▶ WWW-Authenticate
- ▶ Allow
- ▶ Content-Encoding
- ▶ Content-Length
- ▶ Content-Type
- ▶ Expires
- ▶ Last-Modified

# HTTP/1.0 - statusy

200	OK
201	Created
202	Accepted
204	No Content
301	Moved Permanently
302	Moved Temporarily
304	Not Modified
400	Bad Request
401	Unauthorized
403	Forbidden
404	Not Found
500	Internal Server Error
501	Not Implemented
502	Bad Gateway
503	Service Unavailable

# HTTP/1.1

```
https://tools.ietf.org/html/rfc9112,  
https://tools.ietf.org/html/rfc9110,  
https://tools.ietf.org/html/rfc9111, ...
```

# HTTP/1.1

```
https://tools.ietf.org/html/rfc9112,  
https://tools.ietf.org/html/rfc9110,  
https://tools.ietf.org/html/rfc9111, ...
```

## Request

```
GET /index.html HTTP/1.1  
User-Agent: browser  
Host: www.example.com  
Connection: keep-alive
```

# HTTP/1.1

## Nagłówki

Cache-Control, Connection, Date, Pragma, Trailer, Transfer-Encoding, Upgrade, Via, Warning, Accept, Accept-Charset, Accept-Encoding, Accept-Language, Authorization, Expect, From, Host, If-Match, If-Modified-Since, If-None-Match, If-Range, If-Unmodified-Since, Max-Forwards, Proxy-Authorization, Range, Referer, TE, User-Agent, Accept-Ranges, Age, ETag, Location, Proxy-Authenticate, Retry-After, Server, Vary, WWW-Authenticate, Allow, Content-Encoding, Content-Language, Content-Length, Content-Location, Content-MD5, Content-Range, Content-Type, Expires, Last-Modified, *i inne*

# HTTP/1.1

- ▶ cache, proxy

# HTTP/1.1

- ▶ cache, proxy
- ▶ serwery wirtualne, nagłówek Host



# HTTP/1.1

- ▶ cache, proxy
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- ▶ ciasteczka

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- ▶ utrzymywanie połączenia, strumień zapytań

# HTTP/1.1

- ▶ cache, proxy
- ▶ serwery wirtualne, nagłówek Host
- ▶ ciasteczka
- ▶ utrzymywanie połączenia, strumień zapytań
- ▶ kompresje

# HTTP/1.1

- ▶ cache, proxy
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- ▶ kompresje
- ▶ range

# HTTP/1.1

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- ▶ kompresje
- ▶ range
- ▶ chunk

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- ▶ kompresje
- ▶ range
- ▶ chunk
- ▶ negocjacja zawartości

# HTTP/1.1

- ▶ cache, proxy
- ▶ serwery wirtualne, nagłówek Host
- ▶ ciasteczka
- ▶ utrzymywanie połączenia, strumień zapytań
- ▶ kompresje
- ▶ range
- ▶ chunk
- ▶ negocjacja zawartości
- ▶ metoda OPTIONS, nagłówek Expect

# HTTP/2 i HTTP/3

`https://tools.ietf.org/html/rfc9113,`  
`https://tools.ietf.org/html/rfc9114,`



# Python

## Klient

```
#!/usr/bin/env python3
```

```
import socket
```

```
HOST = 'satori.tcs.uj.edu.pl'
```

```
PORT = 80
```

```
PATH = '/'
```

```
sock = socket.create_connection((HOST, PORT))
```

```
request = b'\r\n'.join([ bytes(line, 'utf-8') for line in [
    f'GET {PATH} HTTP/1.0',
    f'Host: {HOST}',
    '',
    ''
]])
```

```
sock.sendall(request)
```

```
response = b''
```

```
while True:
```

```
    part = sock.recv(8192)
```

```
    if part == b'':
```

```
        break
```

```
    response += part
```



# Python

## Klient

```
#!/usr/bin/env python3
```

```
import requests
```

```
HOST = 'satori.tcs.uj.edu.pl'
```

```
PORT = 80
```

```
PATH = '/'
```

```
response = requests.get(f'http://{HOST}:{PORT}/{PATH.lstrip("/")}', allow_redirects=False)
```

```
print(response.status_code)
```

```
print(response.reason)
```

```
print(response.headers)
```

```
print(response.content)
```

# Python

## Serwer

```
#!/usr/bin/env python3
```

```
import socket
import threading
```

```
def handle_client(client_socket, client_address):
    try:
        request = b''
        while len(request)<4 or request[-4:] != b'\r\n\r\n':
            add = client_socket.recv(1)
            if not add:
                client_socket.close()
                return
            request += add
        response = b'\r\n'.join([ bytes(line, 'utf-8') for line in [
            'HTTP/1.0 200 OK',
            'Content-Type: text/plain; charset=utf-8',
            'Content-Length: 2',
            '',
            'OK',
        ]])
        client_socket.sendall(response)
    finally:
        client_socket.close()
```

# Python

## Serwer 2

```
#!/usr/bin/env python3
```

```
import http.server
```

```
class HTTPHandler(http.server.BaseHTTPRequestHandler):  
    protocol_version = 'HTTP/1.0'  
    def version_string(self):  
        return 'HTTPServer'  
    def do_HEAD(self):  
        self.send_response(200)  
        self.end_headers()  
  
    def do_GET(self):  
        response = b'OK'  
  
        self.send_response(200)  
        self.send_header('Content-Type', 'text/plain; charset=utf-8')  
        self.send_header('Content-Length', str(len(response)))  
        self.end_headers()  
        self.wfile.write(response)  
  
    def do_POST(self):  
        return self.do_GET()
```



# Python

## Serwer 3

```
#!/usr/bin/env python3

import tornado.ioloop
import tornado.web

class Handler(tornado.web.RequestHandler):
    def get(self):
        self.set_status(200)
        self.set_header("Content-type", "text/html; charset=utf-8")
        self.write("OK")

app = tornado.web.Application([(r'.*', Handler)])
app.listen(80)
tornado.ioloop.IOLoop.current().start()
```

# Request

GET / HTTP/1.1

Host: www.grzegorzgutowski.staff.tcs.uj.edu.pl

User-Agent: browser

Connection: close



## Response

HTTP/1.1 301 Moved Permanently  
Date: Tue, 15 Dec 2015 22:43:51 GMT  
Server: Apache/2.4.7 (Ubuntu)  
Location: <http://grzegorzgutowski.staff.tcs.uj.edu.pl/>  
Content-Length: 353  
Connection: close  
Content-Type: text/html; charset=iso-8859-1

```
<!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="http://grzegorzgutowski.staff.tcs.uj.edu.pl/">here</a>.</p>  
<hr>  
<address>Apache/2.4.7 (Ubuntu) Server at grzegorzgutowski.staff.tcs.uj.edu.pl Port 80</address>  
</body></html>
```

# Request

GET / HTTP/1.1

Host: `www.grzegorzgutowski.staff.tcs.uj.edu.pl`

User-Agent: browser

Connection: keep-alive

GET / HTTP/1.1

Host: `grzegorzgutowski.staff.tcs.uj.edu.pl`

User-Agent: browser

Connection: keep-alive





## Response

HTTP/1.1 301 Moved Permanently  
Date: Tue, 15 Dec 2015 22:44:37 GMT  
Server: Apache/2.4.7 (Ubuntu)  
Location: <http://grzegorzgutowski.staff.tcs.uj.edu.pl/>  
Content-Length: 353  
Keep-Alive: timeout=5, max=100  
Connection: Keep-Alive  
Content-Type: text/html; charset=iso-8859-1

```
<!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="http://grzegorzgutowski.staff.tcs.uj.edu.pl/">here</a>.</p>  
<hr>  
<address>Apache/2.4.7 (Ubuntu) Server at grzegorzgutowski.staff.tcs.uj.edu.pl Port 80</address>  
</body></html>
```

HTTP/1.1 302 Moved Temporarily  
Date: Tue, 15 Dec 2015 22:44:37 GMT  
Server: Apache/2.4.7 (Ubuntu)  
X-Powered-By: PHP/5.5.9-1ubuntu4.13  
Location: ?pos=info  
Content-Length: 0  
Keep-Alive: timeout=5, max=99  
Connection: Keep-Alive  
Content-Type: text/html; charset=UTF-8



## Request

GET / HTTP/1.1

Host: www.grzegorzgutowski.staff.tcs.uj.edu.pl

User-Agent: browser

Connection: keep-alive

GET / HTTP/1.1

Host: grzegorzgutowski.staff.tcs.uj.edu.pl

User-Agent: browser

Connection: keep-alive

GET /?pos=info HTTP/1.1

Host: grzegorzgutowski.staff.tcs.uj.edu.pl

User-Agent: browser

Connection: keep-alive

## Response

HTTP/1.1 301 Moved Permanently  
Date: Tue, 15 Dec 2015 22:45:32 GMT  
Server: Apache/2.4.7 (Ubuntu)  
Location: <http://grzegorzgutowski.staff.tcs.uj.edu.pl/>  
Content-Length: 353  
Keep-Alive: timeout=5, max=100  
Connection: Keep-Alive  
Content-Type: text/html; charset=iso-8859-1

```
<!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="http://grzegorzgutowski.staff.tcs.uj.edu.pl/">here</a>.</p>  
<hr>  
<address>Apache/2.4.7 (Ubuntu) Server at grzegorzgutowski.staff.tcs.uj.edu.pl Port 80</address>  
</body></html>
```

HTTP/1.1 302 Moved Temporarily  
Date: Tue, 15 Dec 2015 22:45:32 GMT  
Server: Apache/2.4.7 (Ubuntu)  
X-Powered-By: PHP/5.5.9-1ubuntu4.13  
Location: ?pos=info  
Content-Length: 0  
Keep-Alive: timeout=5, max=99  
Connection: Keep-Alive  
Content-Type: text/html; charset=UTF-8



# Request

```
GET /?pos=info HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: keep-alive
Accept-Encoding: gzip
```



## Response

```
HTTP/1.1 200 OK
Date: Tue, 15 Dec 2015 22:48:37 GMT
Server: Apache/2.4.7 (Ubuntu)
X-Powered-By: PHP/5.5.9-1ubuntu4.13
Set-Cookie: id=f6f54ad077d7990cf4feff593fe25708
Vary: Accept-Encoding
Content-Encoding: gzip
Content-Length: 2071
Keep-Alive: timeout=5, max=100
Connection: Keep-Alive
Content-Type: text/html; charset=UTF-8
```

2071 BYTES

# Request

```
GET / HTTP/1.1
Host: www.google.com
User-Agent: browser
Connection: keep-alive
Accept: */*
Accept-Language: pl
```



## Response

HTTP/1.1 200 OK

Date: Tue, 15 Dec 2015 23:11:59 GMT

Expires: -1

Cache-Control: private, max-age=0

Content-Type: text/html; charset=ISO-8859-2

P3P: CP="This is not a P3P policy! See <https://www.google.com/support/accounts/answer/151657?hl=en> for more info."

Server: gws

X-XSS-Protection: 1; mode=block

X-Frame-Options: SAMEORIGIN

Set-Cookie: NID=74=S1e\_jv1pNhzzppf99Ph3MnpZGd\_mb-REU-5t1xa75cpC3Ud6ZZmMwdrwfzLFyAKCT15HqQejq-MTr6SIt3BU6TqsXUAHjxrro8KoSIviVjzSuQuoQhQA

Accept-Ranges: none

Vary: Accept-Encoding

Transfer-Encoding: chunked

4b6c

19308 BYTES

0

# Request

```
GET / HTTP/1.1
Host: www.google.com
User-Agent: browser
Connection: keep-alive
Accept: */*
Accept-Language: de
```





## Response

HTTP/1.1 200 OK

Date: Tue, 15 Dec 2015 23:12:04 GMT

Expires: -1

Cache-Control: private, max-age=0

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

P3P: CP="This is not a P3P policy! See <https://www.google.com/support/accounts/answer/151657?hl=en> for more info."

Server: gws

X-XSS-Protection: 1; mode=block

X-Frame-Options: SAMEORIGIN

Set-Cookie: NID=74=0hZIXvdGCPn0\_y1yU9ktnX7cPxK\_4CxFW2BDtGuQeFmBo\_PfQDyV72y-UALbk8Ln6M5x1LsEi6QEwuSx0e9zlmJqPRIImmTRpS\_rim4GYylbgt0a69KQ

Accept-Ranges: none

Vary: Accept-Encoding

Transfer-Encoding: chunked

49f3

18931 BYTES

0

# Request

```
GET /images/branding/product/ico/googleg_lodp.ico HTTP/1.1  
Host: www.google.com  
User-Agent: browser  
Connection: keep-alive
```

## Response

```
HTTP/1.1 200 OK
Vary: Accept-Encoding
Content-Type: image/x-icon
Date: Wed, 16 Dec 2015 08:28:40 GMT
Expires: Wed, 16 Dec 2015 08:28:40 GMT
Cache-Control: private, max-age=31536000
Last-Modified: Thu, 20 Aug 2015 15:33:28 GMT
X-Content-Type-Options: nosniff
Server: sffe
X-XSS-Protection: 1; mode=block
Accept-Ranges: none
Transfer-Encoding: chunked
```

```
1536
5430 BYTES
0
```

# Request

```
GET /images/branding/product/ico/googleg_lodp.ico HTTP/1.1  
Host: www.google.com  
User-Agent: browser  
Connection: close  
If-Modified-Since: Thu, 20 Aug 2015 15:33:28 GMT
```

# Response

```
HTTP/1.1 304 Not Modified
Date: Tue, 15 Dec 2015 23:23:22 GMT
Expires: Tue, 15 Dec 2015 23:23:22 GMT
Cache-Control: private, max-age=31536000
Last-Modified: Thu, 20 Aug 2015 15:33:28 GMT
X-Content-Type-Options: nosniff
Server: sffe
X-XSS-Protection: 1; mode=block
Connection: close
```

# Request

```
GET /breugel/angels.png HTTP/1.1  
Host: grzegorzgutowski.staff.tcs.uj.edu.pl  
User-Agent: browser  
Connection: close
```



## Response

```
HTTP/1.1 200 OK
Date: Tue, 15 Dec 2015 23:24:24 GMT
Server: Apache/2.4.7 (Ubuntu)
Last-Modified: Thu, 15 Oct 2015 09:14:05 GMT
ETag: "22c27cf-5222119c2c19e"
Accept-Ranges: bytes
Content-Length: 36448207
Connection: close
Content-Type: image/png
```

36448207 BYTES

# Request

```
GET /breugel/angels.png HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: close
If-Modified-Since: Thu, 15 Oct 2015 09:14:05 GMT
```





# Response

```
HTTP/1.1 304 Not Modified  
Date: Tue, 15 Dec 2015 23:30:04 GMT  
Server: Apache/2.4.7 (Ubuntu)  
Connection: close  
ETag: "22c27cf-5222119c2c19e"
```



# Request

```
GET /breugel/angels.png HTTP/1.1  
Host: grzegorzgutowski.staff.tcs.uj.edu.pl  
User-Agent: browser  
Connection: close  
If-None-Match: "22c27cf-5222119c2c19e"
```

# Response

```
HTTP/1.1 304 Not Modified
Date: Tue, 15 Dec 2015 23:29:53 GMT
Server: Apache/2.4.7 (Ubuntu)
Connection: close
ETag: "22c27cf-5222119c2c19e"
```



# Request

```
GET /breugel/angels.png HTTP/1.1  
Host: grzegorzgutowski.staff.tcs.uj.edu.pl  
User-Agent: browser  
Range: bytes=36448207-  
Connection: close
```



## Response

HTTP/1.1 416 Requested Range Not Satisfiable  
Date: Tue, 15 Dec 2015 23:47:22 GMT  
Server: Apache/2.4.7 (Ubuntu)  
Connection: close  
Transfer-Encoding: chunked  
Content-Type: text/html; charset=iso-8859-1

19f

```
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">  
<html><head>  
<title>416 Requested Range Not Satisfiable</title>  
</head><body>  
<h1>Requested Range Not Satisfiable</h1>  
<p>None of the range-specifier values in the Range  
request-header field overlap the current extent  
of the selected resource.</p>  
<hr>  
<address>Apache/2.4.7 (Ubuntu) Server at grzegorzgutowski.staff.tcs.uj.edu.pl Port 80</address>  
</body></html>
```

0

# Request

```
GET /breugel/angels.png HTTP/1.1  
Host: grzegorzgutowski.staff.tcs.uj.edu.pl  
User-Agent: browser  
Range: bytes=36448200-  
Connection: close
```



## Response

```
HTTP/1.1 206 Partial Content
Date: Tue, 15 Dec 2015 23:47:40 GMT
Server: Apache/2.4.7 (Ubuntu)
Last-Modified: Thu, 15 Oct 2015 09:14:05 GMT
ETag: "22c27cf-5222119c2c19e"
Accept-Ranges: bytes
Content-Length: 7
Content-Range: bytes 36448200-36448206/36448207
Connection: close
Content-Type: image/png
```

7 BYTES

# Request

```
GET /breugel/angels.png HTTP/1.1  
Host: grzegorzgutowski.staff.tcs.uj.edu.pl  
User-Agent: browser  
Range: bytes=36448200-  
Connection: close  
If-Range: "22c27cf-5222119c2c19e"
```





## Response

```
HTTP/1.1 206 Partial Content
Date: Tue, 15 Dec 2015 23:49:02 GMT
Server: Apache/2.4.7 (Ubuntu)
Last-Modified: Thu, 15 Oct 2015 09:14:05 GMT
ETag: "22c27cf-5222119c2c19e"
Accept-Ranges: bytes
Content-Length: 7
Content-Range: bytes 36448200-36448206/36448207
Connection: close
Content-Type: image/png
```

7 BYTES

# Request

```
GET /breugel/angels.png HTTP/1.1  
Host: grzegorzgutowski.staff.tcs.uj.edu.pl  
User-Agent: browser  
Range: bytes=36448200-  
Connection: close  
If-Range: "zly-hash"
```

## Response

```
HTTP/1.1 200 OK
Date: Tue, 15 Dec 2015 23:49:26 GMT
Server: Apache/2.4.7 (Ubuntu)
Last-Modified: Thu, 15 Oct 2015 09:14:05 GMT
ETag: "22c27cf-5222119c2c19e"
Accept-Ranges: bytes
Content-Length: 36448207
Connection: close
Content-Type: image/png
```

36448207 BYTES

# Request

```
GET /breugel/angels.png HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: close
If-Unmodified-Since: Thu, 15 Oct 2010 09:14:05 GMT
```



## Response

```
HTTP/1.1 412 Precondition Failed
Date: Wed, 16 Dec 2015 00:02:52 GMT
Server: Apache/2.4.7 (Ubuntu)
Last-Modified: Thu, 15 Oct 2015 09:14:05 GMT
ETag: "22c27cf-5222119c2c19e"
Accept-Ranges: bytes
Content-Length: 0
Connection: close
Content-Type: image/png
```

## Request

```
GET /secret/ HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: keep-alive
```

```
GET /secret/ HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Authorization: Basic YWRtaW46YWRtaW4=
Connection: keep-alive
```

## Response

```
HTTP/1.1 401 Unauthorized
Date: Wed, 16 Dec 2015 00:20:41 GMT
Server: Apache/2.4.7 (Ubuntu)
WWW-Authenticate: Basic realm="Password Required"
Content-Length: 482
Keep-Alive: timeout=5, max=100
Connection: Keep-Alive
Content-Type: text/html; charset=iso-8859-1
```

```
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<html><head>
<title>401 Unauthorized</title>
</head><body>
<h1>Unauthorized</h1>
<p>This server could not verify that you
are authorized to access the document
requested. Either you supplied the wrong
credentials (e.g., bad password), or your
browser doesn't understand how to supply
the credentials required.</p>
<hr>
<address>Apache/2.4.7 (Ubuntu) Server at grzegorzgutowski.staff.tcs.uj.edu.pl Port 80</address>
</body></html>
HTTP/1.1 200 OK
Date: Wed, 16 Dec 2015 00:20:41 GMT
Server: Apache/2.4.7 (Ubuntu)
Vary: Accept-Encoding
Content-Length: 764
```

# Request

```
GET /confidential/ HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: keep-alive
```

```
GET /confidential/ HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Authorization: Digest username="admin", realm="Password Required", nonce="KaqFivkmBQA=6d86a1d7745f2ac8bf33c80effdb19034fc9e0bc", uri="
Connection: keep-alive
```





## Response

HTTP/1.1 401 Unauthorized

Date: Wed, 16 Dec 2015 00:41:50 GMT

Server: Apache/2.4.7 (Ubuntu)

WWW-Authenticate: Digest realm="Password Required", nonce="KaqFivkmBQA=6d86aid7745f2ac8bf33c80effdb19034fc9e0bc", algorithm=MD5, domain=

Content-Length: 482

Keep-Alive: timeout=5, max=100

Connection: Keep-Alive

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

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

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

```
<title>401 Unauthorized</title>
```

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

```
<h1>Unauthorized</h1>
```

```
<p>This server could not verify that you  
are authorized to access the document  
requested. Either you supplied the wrong  
credentials (e.g., bad password), or your  
browser doesn't understand how to supply  
the credentials required.</p>
```

```
<hr>
```

```
<address>Apache/2.4.7 (Ubuntu) Server at grzegorzgutowski.staff.tcs.uj.edu.pl Port 80</address>
```

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

HTTP/1.1 200 OK

Date: Wed, 16 Dec 2015 00:41:50 GMT

Server: Apache/2.4.7 (Ubuntu)

Authentication-Info: rspauth="920ced90598ae3ca3cdfc13066dc4a53", cnonce="1d7749be", nc=00000001, qop=auth

Vary: Accept-Encoding



## Request

```
GET /form/get.html HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: keep-alive
```

```
GET /form/check.php?login=user&password=pass HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: keep-alive
```

```
POST /form/check.php HTTP/1.1
Host: grzegorzgutowski.staff.tcs.uj.edu.pl
User-Agent: browser
Connection: keep-alive
Content-Type: application/x-www-form-urlencoded
Content-Length: 26
```

```
login=admin&password=admin
```

## Response

```
HTTP/1.1 200 OK
Date: Wed, 16 Dec 2015 01:16:39 GMT
Server: Apache/2.4.7 (Ubuntu)
Last-Modified: Wed, 16 Dec 2015 01:12:37 GMT
ETag: "1a1-526f99a1aa238"
Accept-Ranges: bytes
Content-Length: 417
Vary: Accept-Encoding
Keep-Alive: timeout=5, max=100
Connection: Keep-Alive
Content-Type: text/html; charset=UTF-8
```

```
<!doctype html>
<html>
<head>
<title>Login form</title>
</head>
<body>
<form method='GET' action='check.php'>
  <fieldset>
    <legend>Login credentials</legend>
    <label for='login'>Login:</label>
    <input name='login' type='text' value='user'>
    <label for='password'>Password:</label>
    <input name='password' type='password' value='pass'>
    <input type='submit' value='Login'>
  </fieldset>
</form>
```

## Request

```
GET /cookie/ HTTP/1.1
connection: keep-alive
host: grzegorzgutowski.staff.tcs.uj.edu.pl
user-agent: browser
```

```
GET /cookie/ HTTP/1.1
connection: keep-alive
host: grzegorzgutowski.staff.tcs.uj.edu.pl
cookie: cookie=Here%2C+take+a+cookie.+I+promise+by+the+time+you%27ve+done+eating+it+you%27ll+feel+right+as+rain.
user-agent: browser
```

## Response

```
HTTP/1.1 302 Moved Temporarily
Date: Wed, 16 Dec 2015 06:36:29 GMT
Server: Apache/2.4.7 (Ubuntu)
X-Powered-By: PHP/5.5.9-1ubuntu4.13
Set-Cookie: cookie=Here%2C+take+a+cookie.+I+promise+by+the+time+you%27ve+done+eating+it+you%27ll+feel+right+as+rain.
location: /cookie/
Content-Length: 0
Keep-Alive: timeout=5, max=100
Connection: Keep-Alive
Content-Type: text/html; charset=UTF-8
```

```
HTTP/1.1 302 Moved Temporarily
Date: Wed, 16 Dec 2015 06:36:29 GMT
Server: Apache/2.4.7 (Ubuntu)
X-Powered-By: PHP/5.5.9-1ubuntu4.13
Set-Cookie: cookie=Here%2C+take+a+cookie.+I+promise+by+the+time+you%27ve+done+eating+it+you%27ll+feel+right+as+rain.
location: /cookie/
Content-Length: 0
Keep-Alive: timeout=5, max=99
Connection: Keep-Alive
Content-Type: text/html; charset=UTF-8
```

# Request

```
HEAD / HTTP/1.1
Host: www.google.pl
User-Agent: browser
Connection: keep-alive
Accept: */*
Accept-Language: pl
```



## Response

HTTP/1.1 200 OK

Date: Wed, 16 Dec 2015 06:45:05 GMT

Expires: -1

Cache-Control: private, max-age=0

Content-Type: text/html; charset=ISO-8859-2

P3P: CP="This is not a P3P policy! See <https://www.google.com/support/accounts/answer/151657?hl=en> for more info."

Server: gws

X-XSS-Protection: 1; mode=block

X-Frame-Options: SAMEORIGIN

Set-Cookie: NID=74=publRrbwQqK0kRY2NRdxedBb71Z55rr25V9a4RmECdUBLfpDqIBID46mNK8tWte80U6F\_KTOPXjCvcS8Zgn2Ee1I964j2adhI22eppwGd9xLuk0XzI

Transfer-Encoding: chunked

Accept-Ranges: none

Vary: Accept-Encoding

Gdzie to wszystko jest zaimplementowane?