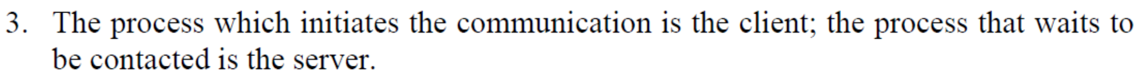
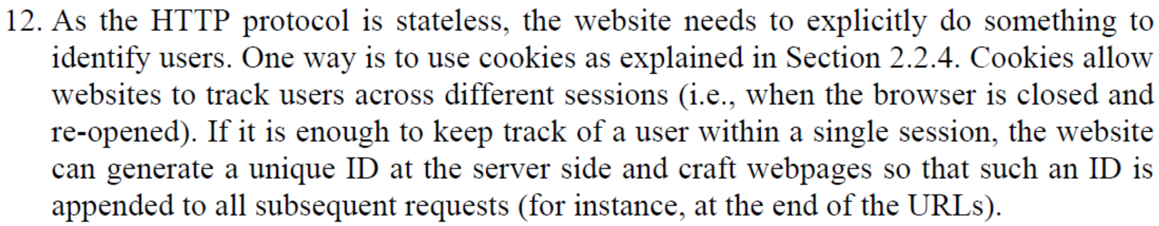
Solutions Networking 2

R3



3. The process which initiates the communication is the client; the process that waits to be contacted is the server.

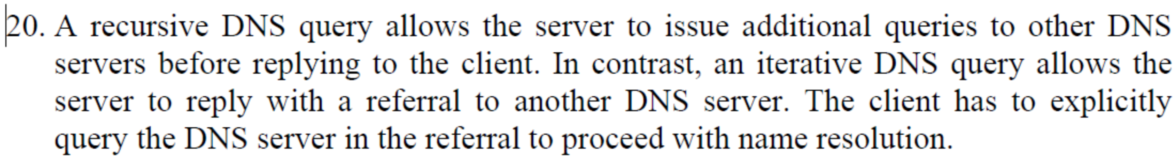
R12



12. As the HTTP protocol is stateless, the website needs to explicitly do something to identify users. One way is to use cookies as explained in Section 2.2.4. Cookies allow websites to track users across different sessions (i.e., when the browser is closed and re-opened). If it is enough to keep track of a user within a single session, the website can generate a unique ID at the server side and craft webpages so that such an ID is appended to all subsequent requests (for instance, at the end of the URLs).

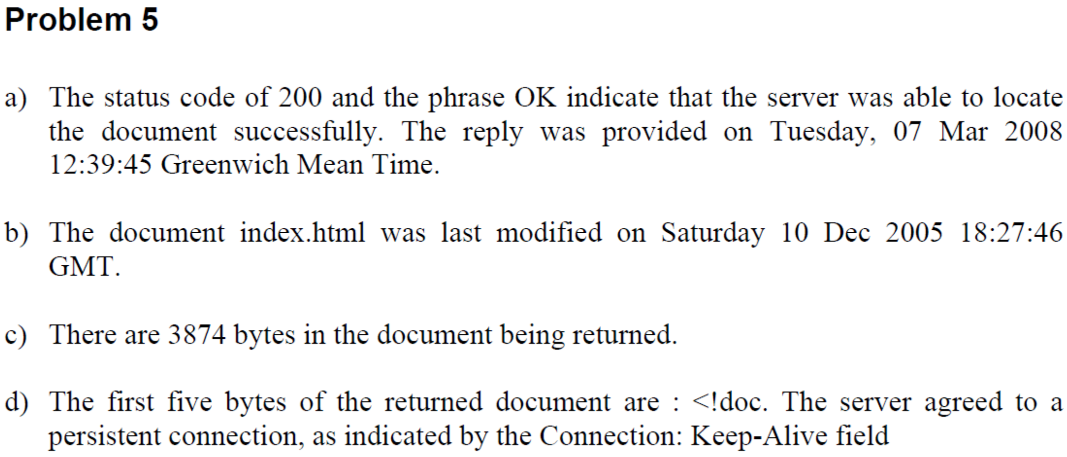
Moreover, from [DF] you studied already `localStorage` / `sessionStorage`. Other options can be found for example here: https://stackoverflow.com/questions/95655/comparison-of-ways-to-maintain-state

R20



20. A recursive DNS query allows the server to issue additional queries to other DNS servers before replying to the client. In contrast, an iterative DNS query allows the server to reply with a referral to another DNS server. The client has to explicitly query the DNS server in the referral to proceed with name resolution.

P5



Problem 5

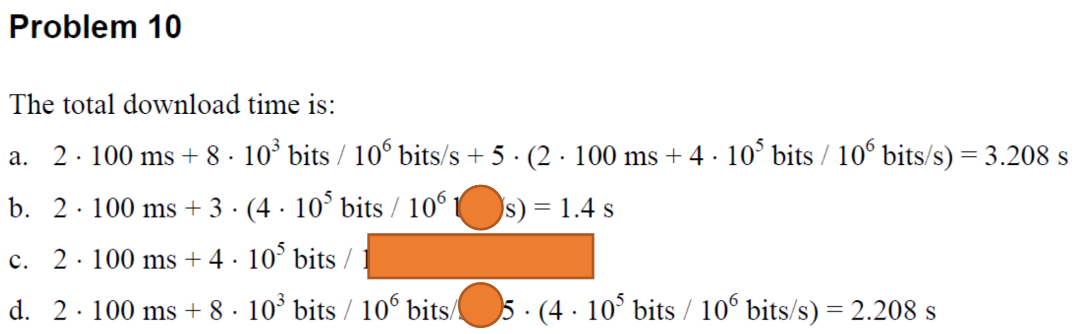
a) The status code of 200 and the phrase OK indicate that the server was able to locate the document successfully. The reply was provided on Tuesday, 07 Mar 2008 12:39:45 Greenwich Mean Time.

b) The document index.html was last modified on Saturday 10 Dec 2005 18:27:46 GMT.

c) There are 3874 bytes in the document being returned.

d) The first five bytes of the returned document are : <!doc. The server agreed to a persistent connection, as indicated by the Connection: Keep-Alive field

P10 (Bog løsninger forkerte, se korrigerede svar nedenfor)



Problem 10

The total download time is:

a. $2 \cdot 100$ ms + $8 \cdot 10^3$ bits / 10^6 bits/s + $5 \cdot (2 \cdot 100$ ms + $4 \cdot 10^5$ bits / 10^6 bits/s) = 3.208 s

b. $2 \cdot 100$ ms + $3 \cdot (4 \cdot 10^5$ bits / 10^6 [redacted]s) = 1.4 s

c. $2 \cdot 100$ ms + $4 \cdot 10^5$ bits / 1[redacted]

d. $2 \cdot 100$ ms + $8 \cdot 10^3$ bits / 10^6 bits/[redacted]5 · ($4 \cdot 10^5$ bits / 10^6 bits/s) = 2.208 s

Given: RTT=0.1s, transferrate=10^6 bits/s, main document=8*10^3 bits, image = 8*50*10^3 bits=4*10^5 bits

- Transfertime(1k byte)= 8*10^3 bits / 10^6 b/s= 0,008sek
- Transfertime(50k byte)=0,4 sek

a) We need to download the main-page first: : (2*RTT +transfertime(1kbytes))=0.208
+5*(2*RTT+transfertime(50k bytes)) = 5*(0.2+0.4)=3 sek

Ialt 3.208

b) 2 parallel connections

We need to download the main-page first: : (2*RTT +transfertime(1kbytes)) = 0.208
+
5 images on 2 parallel connections require 3 series of https (img1+2, img3+4, img5):

2*(2*RTT+transfertime(2*50kbytes)) = 2*(0.2+0.8)=2 sek
+
1*(2*RTT+transfertime(1*50kbytes)) = 0.2+0.4= 0.6 sek

Ialt 2.808

C) 6 parallel connections
We need to download the main-page first: (2*RTT +transfertime(1kbytes)) = 0.208
+
2*RTT + 5*transfertime(50 kbyte) = 0.2+2 sek

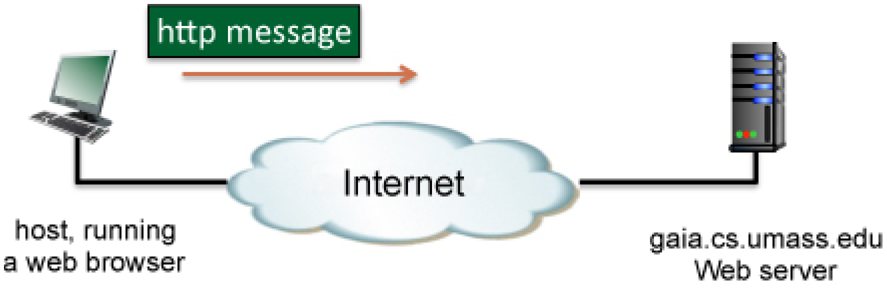
I alt: 2.408

D) One persistent connection with pipelining
We need to download the main-page first: (2*RTT +transfertime(1kbytes)) = 0.208
+RTT (5 requests+responses handled as 1)+5*transfertime(50 kbyte) = 0.1+2 sek

I alt 2.308

The HTTP GET message

Consider the figure below, where a client is sending an HTTP GET message to a web server, gaia.cs.umass.edu.



Suppose the client-to-server HTTP GET message is the following:

```
GET /kurose_ross/interactive/quotation6.htm HTTP/1.0
Host: gaia.cs.umass.edu
If-Modified-Since: Mon, 23 Mar 2020 00:23:34 -0700
```

Answer the following questions:

- What is the name of the file that is being retrieved in this GET message?
- What version of HTTP is the client running?
- Does the client already have a (possibly out-of-date) copy of the requested file? Explain. If so, approximately how long ago did the client receive the file, assuming the GET request has just been issued?

Solution:

The file being fetched is /kurose_ross/interactive/quotation6.htm. The specific file name is quotation7.htm.

- The client is running HTTP version 1.0.
- The time indicated in the browser's If-Modified-Since header field is approximately 30 minutes ago, indicating that is has a cached copy. Therefore the server will only send a copy of the requested URL in response to this HTTP GET message if the server-side copy has been changed in the last 30 minutes.

http://gaia.cs.umass.edu/kurose_ross/interactive/DNS_HTTP_delay.php
Løsning online

P22

Problem 22

For calculating the minimum distribution time for client-server distribution, we use the following formula:

$$D_{cs} = max \{NF/u_s, F/d_{min}\}$$

Similarly, for calculating the minimum distribution time for P2P distribution, we use the following formula:

$$D_{P2P} = max\{F/u_s, F/d_{min}, NF/(u_s + \sum_{i=1}^{N} u_i)\}$$

Where, F = 15 Gbits = 15 * 1024 Mbits
u_s = 30 Mbps
$d_{min} = d_i$ = 2 Mbps

Note, 300Kbps = 300/1024 Mbps.

Client Server

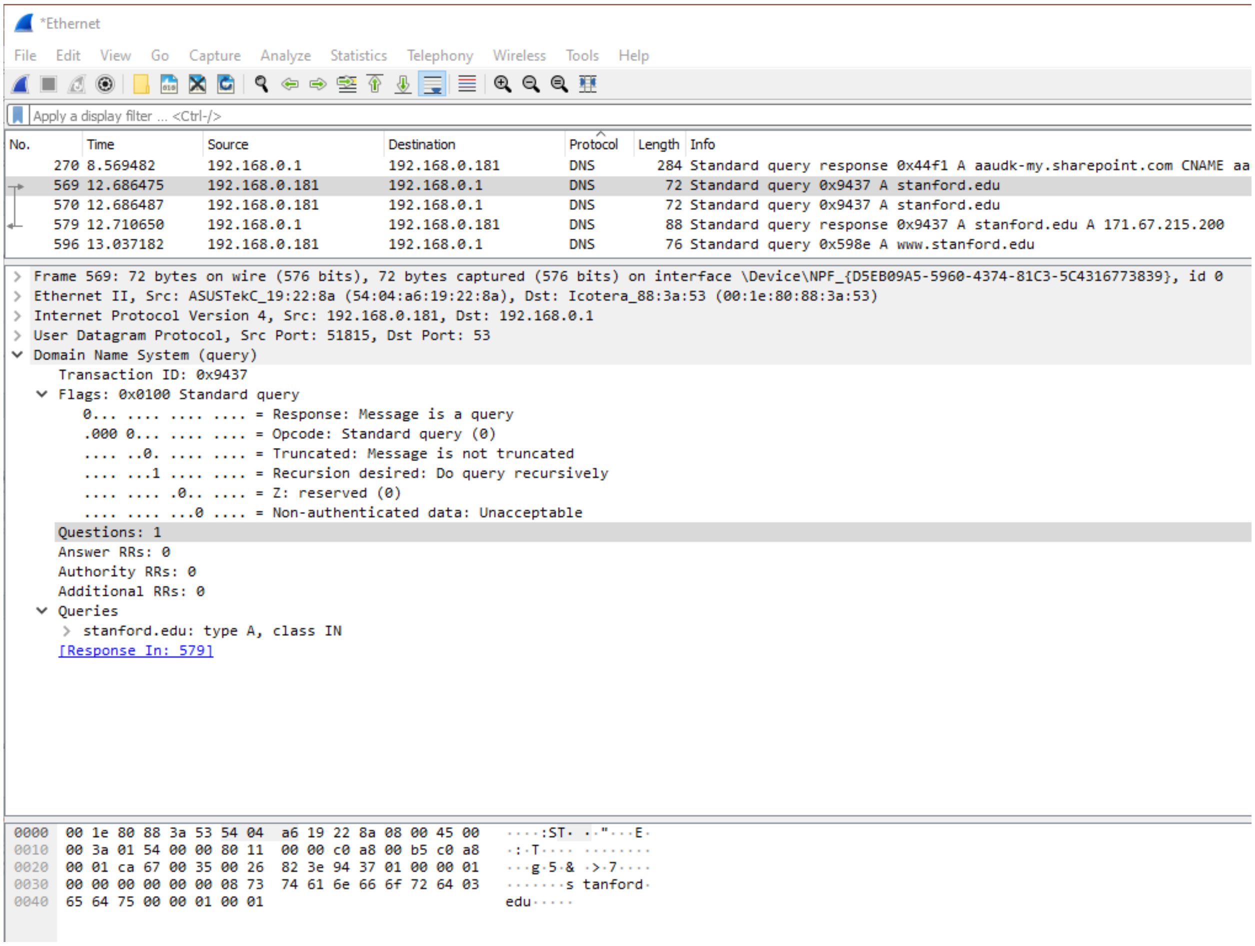
		N		
		10	**100**	**1000**
	300 Kbps	7680	51200	512000
u	**700 Kbps**	7680	51200	512000
	2 Mbps	7680	51200	512000

Peer to Peer

		N		
		10	**100**	**1000**
	300 Kbps	7680	25904	47559
u	**700 Kbps**	7680	15616	21525
	2 Mbps	7680	7680	7680

Practice

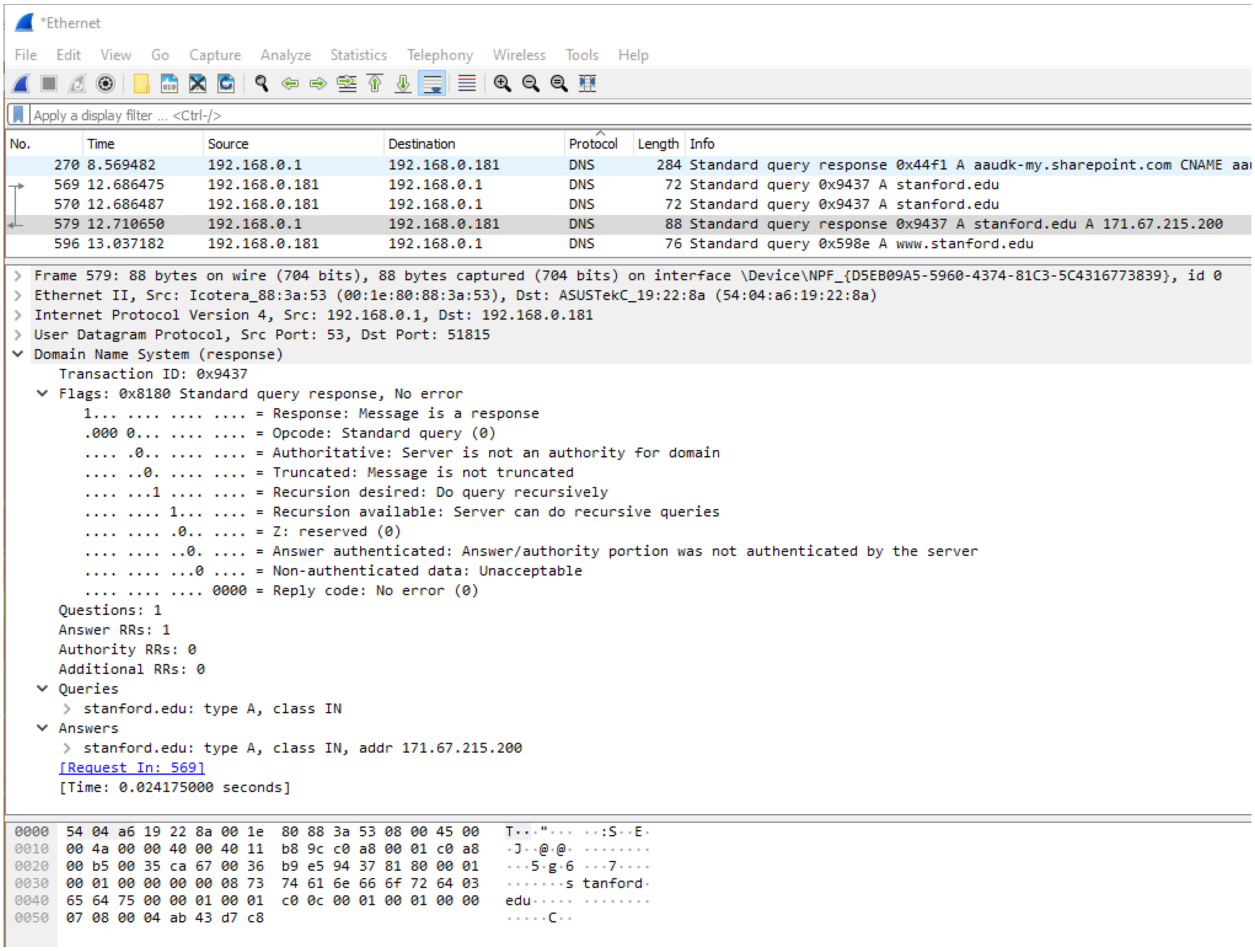
Eksempel (se også slides/video)



```
No.    Time        Source          Destination     Protocol  Length Info
   270 8.569482    192.168.0.1     192.168.0.181   DNS          284 Standard query response 0x44f1 A aaudk-my.sharepoint.com CNAME aa
   569 12.686475   192.168.0.181   192.168.0.1     DNS           72 Standard query 0x9437 A stanford.edu
   570 12.686487   192.168.0.181   192.168.0.1     DNS           72 Standard query 0x9437 A stanford.edu
   579 12.710650   192.168.0.1     192.168.0.181   DNS           88 Standard query response 0x9437 A stanford.edu A 171.67.215.200
   596 13.037182   192.168.0.181   192.168.0.1     DNS           76 Standard query 0x598e A www.stanford.edu
```

```
> Frame 569: 72 bytes on wire (576 bits), 72 bytes captured (576 bits) on interface \Device\NPF_{D5EB09A5-5960-4374-81C3-5C4316773839}, id 0
> Ethernet II, Src: ASUSTekC_19:22:8a (54:04:a6:19:22:8a), Dst: Icotera_88:3a:53 (00:1e:80:88:3a:53)
> Internet Protocol Version 4, Src: 192.168.0.181, Dst: 192.168.0.1
> User Datagram Protocol, Src Port: 51815, Dst Port: 53
v Domain Name System (query)
    Transaction ID: 0x9437
  v Flags: 0x0100 Standard query
      0... .... .... .... = Response: Message is a query
      .000 0... .... .... = Opcode: Standard query (0)
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... .0.. .... = Z: reserved (0)
      .... .... ...0 .... = Non-authenticated data: Unacceptable
    Questions: 1
    Answer RRs: 0
    Authority RRs: 0
    Additional RRs: 0
  v Queries
    > stanford.edu: type A, class IN
    [Response In: 579]
```

```
0000  00 1e 80 88 3a 53 54 04  a6 19 22 8a 08 00 45 00   ····:ST· ··"···E·
0010  00 3a 01 54 00 00 80 11  00 00 c0 a8 00 b5 c0 a8   ·:·T···· ········
0020  00 01 ca 67 00 35 00 26  82 3e 94 37 01 00 00 01   ···g·5·& ·>·7····
0030  00 00 00 00 00 00 08 73  74 61 6e 66 6f 72 64 03   ·······s tanford·
0040  65 64 75 00 00 01 00 01                            edu·····
```


*Ethernet
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter … <Ctrl-/>

```
No.     Time       Source          Destination     Protocol Length Info
    270 8.569482   192.168.0.1     192.168.0.181   DNS        284 Standard query response 0x44f1 A aaudk-my.sharepoint.com CNAME aa
    569 12.686475  192.168.0.181   192.168.0.1     DNS         72 Standard query 0x9437 A stanford.edu
    570 12.686487  192.168.0.181   192.168.0.1     DNS         72 Standard query 0x9437 A stanford.edu
    579 12.710650  192.168.0.1     192.168.0.181   DNS         88 Standard query response 0x9437 A stanford.edu A 171.67.215.200
    596 13.037182  192.168.0.181   192.168.0.1     DNS         76 Standard query 0x598e A www.stanford.edu
```

```
> Frame 579: 88 bytes on wire (704 bits), 88 bytes captured (704 bits) on interface \Device\NPF_{D5EB09A5-5960-4374-81C3-5C4316773839}, id 0
> Ethernet II, Src: Icotera_88:3a:53 (00:1e:80:88:3a:53), Dst: ASUSTekC_19:22:8a (54:04:a6:19:22:8a)
> Internet Protocol Version 4, Src: 192.168.0.1, Dst: 192.168.0.181
> User Datagram Protocol, Src Port: 53, Dst Port: 51815
v Domain Name System (response)
    Transaction ID: 0x9437
  v Flags: 0x8180 Standard query response, No error
      1... .... .... .... = Response: Message is a response
      .000 0... .... .... = Opcode: Standard query (0)
      .... .0.. .... .... = Authoritative: Server is not an authority for domain
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... 1... .... = Recursion available: Server can do recursive queries
      .... .... .0.. .... = Z: reserved (0)
      .... .... ..0. .... = Answer authenticated: Answer/authority portion was not authenticated by the server
      .... .... ...0 .... = Non-authenticated data: Unacceptable
      .... .... .... 0000 = Reply code: No error (0)
    Questions: 1
    Answer RRs: 1
    Authority RRs: 0
    Additional RRs: 0
  v Queries
    > stanford.edu: type A, class IN
  v Answers
    > stanford.edu: type A, class IN, addr 171.67.215.200
    [Request In: 569]
    [Time: 0.024175000 seconds]
```

```
0000  54 04 a6 19 22 8a 00 1e  80 88 3a 53 08 00 45 00   T···"··· ··:S··E·
0010  00 4a 00 00 40 00 40 11  b8 9c c0 a8 00 01 c0 a8   ·J··@·@· ········
0020  00 b5 00 35 ca 67 00 36  b9 e5 94 37 81 80 00 01   ···5·g·6 ···7····
0030  00 01 00 00 00 00 08 73  74 61 6e 66 6f 72 64 03   ·······s tanford·
0040  65 64 75 00 00 01 00 01  c0 0c 00 01 00 01 00 00   edu····· ········
0050  07 08 00 04 ab 43 d7 c8                            ·····C··
```