Internet, Principes et Protocoles (IPP)

Stuff

```
HTTP/1.0 200 OK
Content-Type: text/html; charset=utf-8
Content-Length: 1247
Cache-Control: no-cache, no-store, must-revalidate
Pragma: no-cache
Expires: 0
Server: Microsoft-IIS/7.5
Date: Tue, 04 Feb 2020 09:42:49 GMT

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1"/>
<title>404 - File or directory not found.</title>
<style type="text/css">
<!--
body{margin:0;font-size:.7em;font-family:Verdana, Arial, Helvetica, sans-serif;background:#EEEEEE;}
fieldset{padding:0 15px 10px 15px;}
h1{font-size:2.4em;margin:0;color:#FFF;}
h2{font-size:1.7em;margin:0;color:#CC0000;}
h3{font-size:1.2em;margin:10px 0 0 0;color:#000000;}
#header{width:96%;margin:0 0 0 0;padding:6px 2% 6px 2%;font-family:"trebuchet MS", Verdana, sans-serif;color:#FFF;
background-color:#555555;}
#content{margin:0 0 0 2%;position:relative;}
.content-container{background:#FFF;width:96%;margin-top:8px;padding:10px;position:relative;}
-->
</style>
</head>
<body>
<div id="header"><h1>Server Error</h1></div>
<div id="content">
 <div class="content-container"><fieldset>
  <h2>404 - File or directory not found.</h2>
  <h3>The resource you are looking for might have been removed, had its name changed, or is temporarily unavailable.</h3>
 </fieldset></div>
</div>
</body>
</html>
```

```
HTTP/1.0 200 OK
Content-Type: text/html; charset=utf-8
Content-Length: 5384
Cache-Control: no-cache, no-store, must-revalidate
Pragma: no-cache
Expires: 0
Server: Microsoft-IIS/7.5
Date: Tue, 04 Feb 2020 09:40:55 GMT

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..1...J..R&fM..?.yU.s7......2y.........&....)....H.ub:6..>:.".I.*9..@B.L...Q.k.FEX-.rq..o.#1.....e...!.U.`ox>.
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2W.....Bn#/...#.&j..?}. ......JJ.uD..p..+.RR\'....QS_..4...0".....j.{..X.q.s=..K.@>A.T.o..(p...C=0F..
17:.u.l..T~....ya.m.......2.a.......[..H3.z|.YI..j....p[..w=p.V..$...;..bs.8..Z1O(X.J..dLU.m..%o.E.~.%..........
```
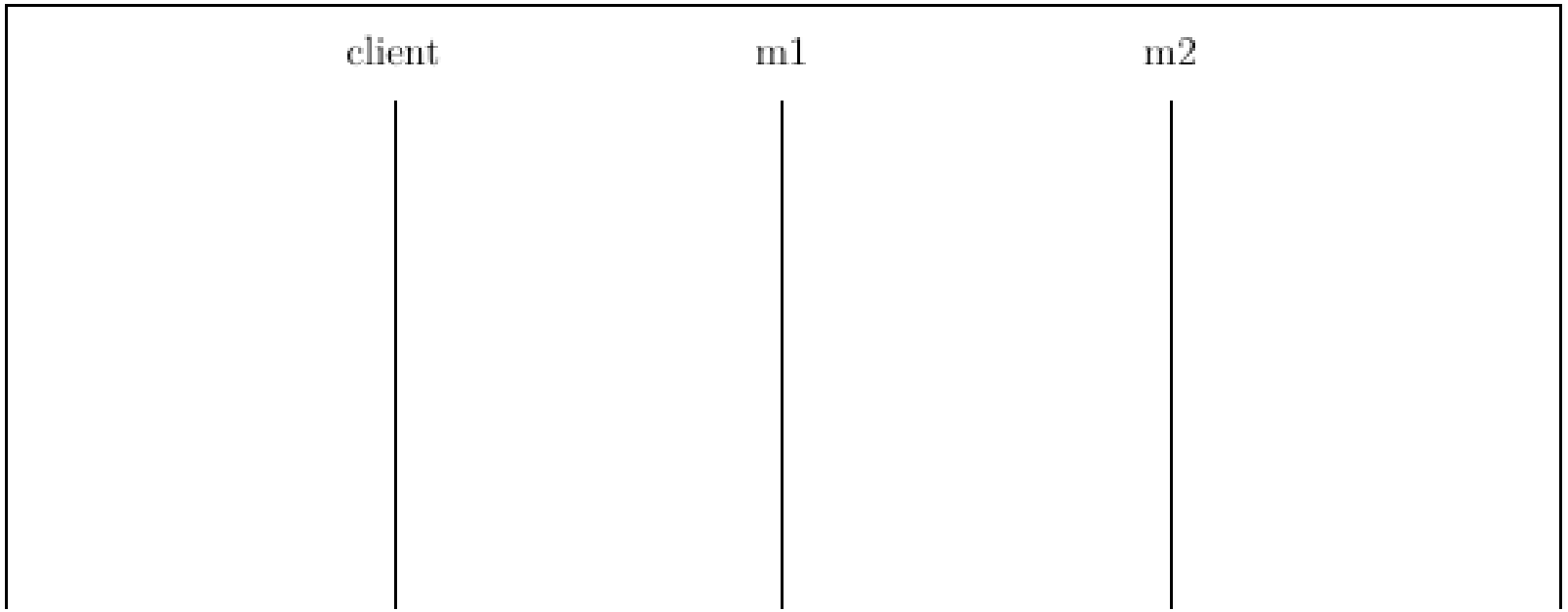
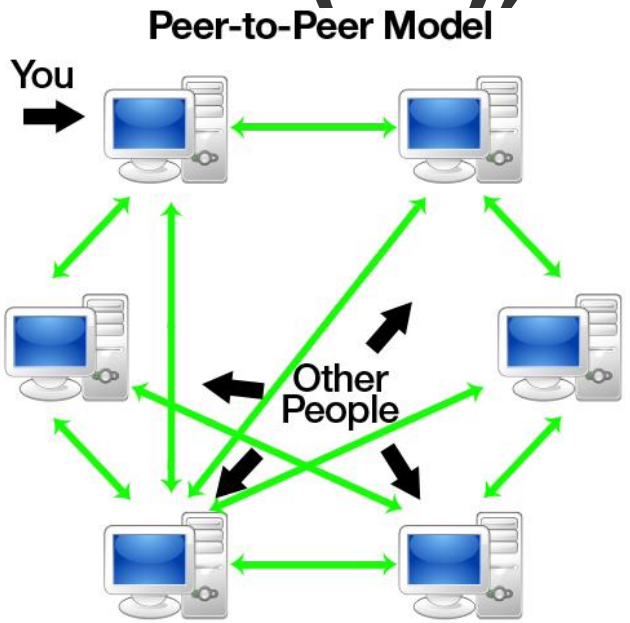

HTTP Exercice

Cette question est relative au protocole HTTP 1.0. Imaginons qu'un client souhaite afficher un page HTML : « `www.m1.com/p.html` ». Cette page fait référence à 4 images qui se trouvent sur deux serveurs distincts : « `www.m1.com/i1.jpg` », « `www.m1.com/i2.jpg` », « `www.m2.com/i3.jpg` » et « `www.m2.com/i4.jpg` ».

Présentez à l'aide du schéma ci-dessous les interactions HTTP entre le client, la machine « `www.m1.com` » et la machine « `www.m2.com` ». N'oubliez pas de montrer les phases de connexion et de déconnexion.



Peer-2-Peer(P2), who uses it?



Peer-2-Peer(P2P), who uses it?

- Video-games (BF3-4, Doom, MW, ..)
- Collaborative applications (shared whiteboard/documents)
- Distributed computation (Etherium, universities, DoD)
- Windows updates
- Skype
- You know more?

Peer-2-Peer(P2P) vs Client-Server

- Usual networks: Clients-Server architecture, the clients send requests to the server. Server = supplier, client = consumer.
- Peer-to-Peer, all the computers in the network can communicate with each other. There is no clear server to supervise the information flow. The peers are both consumers and suppliers.

Client-Server limitations

- What happens if the server goes down? (single point of failure).
- What happens if there is a huge increase in demand?

- *P2P computing/networking is the **sharing** of computer resources and services by **direct exchange** between systems*
  - *Computer resources and services: files, networking, bandwith, processing power...*

Peer-2-Peer (P2)

- All nodes are both client and server (and routers)
- No centralized data source
- The loss of one node does not have an impact on the rest of the network
- Scales easily
- 2 major types: structured and un-structured

Peer-2-Peer (P2)

- Un-Structured network: the network must not use any algorithm for organization or optimization of the network.

  - Pure: no nodes have special functions that could affect the network.

  - Hybrid: Some nodes are a type of central directory server. It generally hold user connection information and file listing for the user (Napster). To be part of the network, a node MUST register witht the directory(-ies)

  - Centralized: Some super-nodes exists. They help manage (index and cache files/information,...) the sub-network they are administering. Chosen on?

  - **1-to-1 when getting a file!**

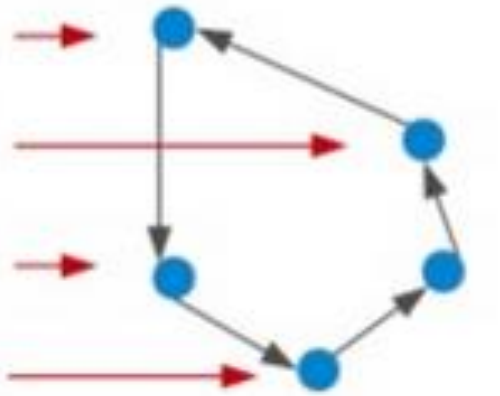
Peer-2-Peer (P2)

- Structured network: the network uses an algorithm for organization or optimization of the network.
  - The algorithm ensures any node can route a search efficiently to a node that can answer it.
  - Most common: Distributed Hash Table
  - **1 to many when getting a file**

Distributed Hash Table

- Instead of having one directory pointing to the files, we use a DHT

Key	Value
Fatemeh	Stockholm
Ali	California
Tallat	Islamabad
Cosmin	Bucharest
Seif	Stockholm
Amir	Tehran



Pairs (Key-Value) are stored in the DHTand any connected Node can retreive the value of A key. Examples: Bittorrent tracker and cryptocoins.

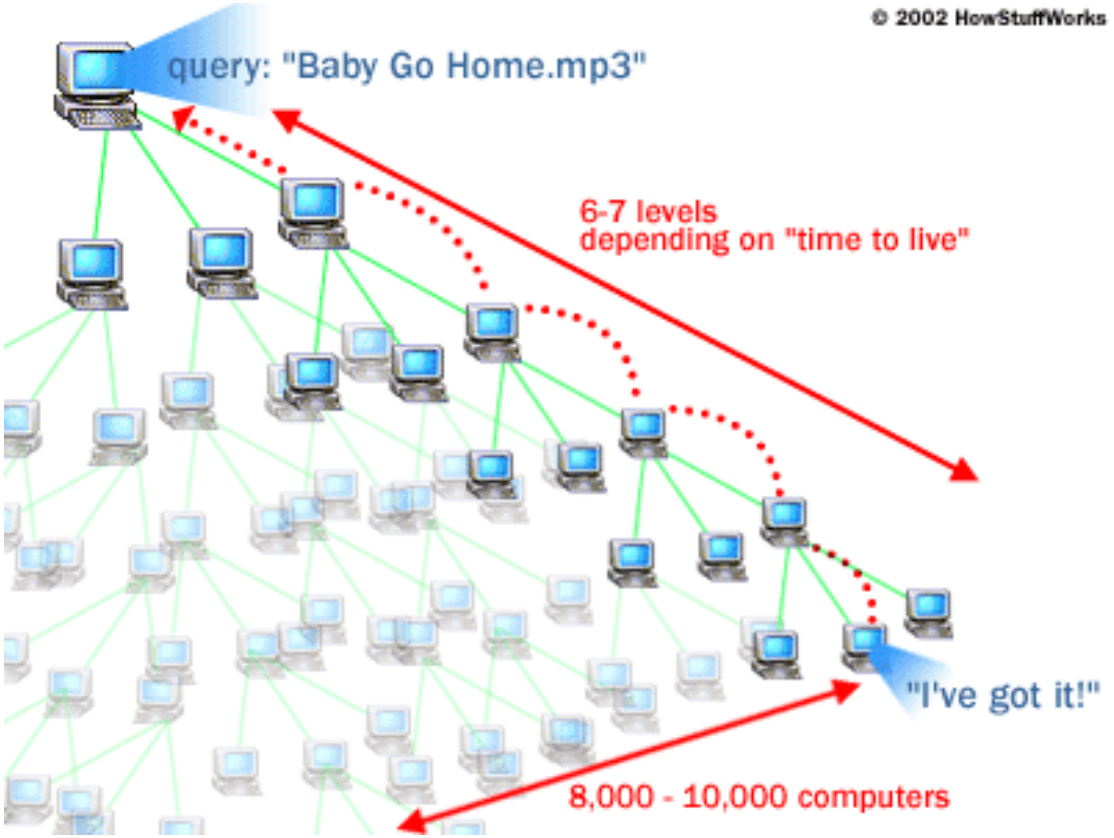
Because each node only contains a portion of the routing table, the process of finding or storing a key/value pair requires contacting multiple nodes. Said algorythm is outside of our scope.

Example: Napster

- A way to share music files with others
- Users upload their lists of files to the Napster server
- You send queries to Napster for files of interest (songs)
- Server replies with the Ips of the users holding the matching files
- You connect directly to these users to download the file.

Example: Gnutella

- A way to share any files.
- Decentralized
- You ask your neighbours for a file
- Neighbours ask their neighbours, and so on
- Users with matching files reply to you



Free-Riding

- P2P networks rely on the users
- Some users can:
  - Download and not share any data
  - Not share any interesting data
- This is called free-riding

- Solutions ?

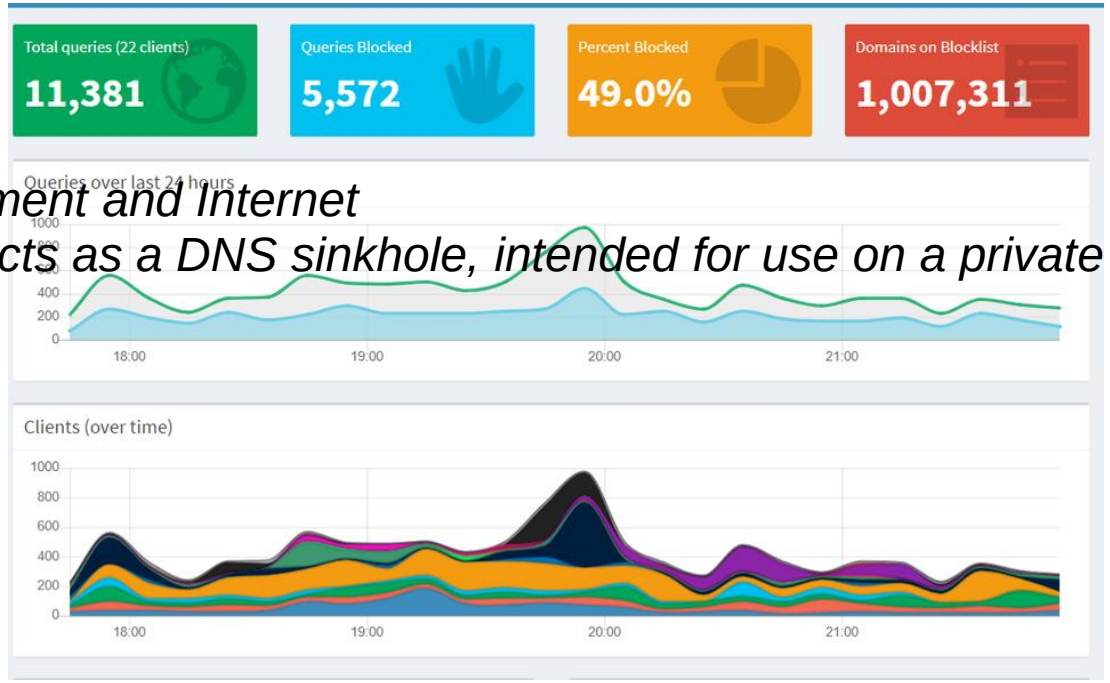
Peer-2-Peer (P2) - Security

- As you know the IP of the peer, you know where/who he is. Thus, you know who is sharing files.
- Paradox: you don't *really* know who it is, and you are trusting it to download files (potentially malicious)

Mini-Project and how Ad blockers work

- Optional mini-project: install a pi-hole at home, or in a VM.

Pi-hole is a network-level advertisement and Internet tracker blocking application which acts as a DNS sinkhole, intended for use on a private network



When changing network settings/installing pi-hole

- Inform your users. They have a right to refuse or ask questions. If they refuse: whitelist their machines. There are options to use it totally anonymously. Use them.
- Be ethical. We are all adults, act like it.
- Expect some hiccups at the beginning. Thats ok.
- Document your changes, so you can revert them if you need to.

P2P networks and P2P file sharing, Pros and Cons

- Pros and Cons of P2P networks and P2P file sharing
  - As a company, would you use it?
  - As a user, in what situation is it good or bad?

- It’s on you now. Think about pros and cons of this technology, for instance at a company level, state level, IPL level, friends level...

P2P, Pros and Cons

- Pros
  - Distributed: more resilient
  - Easy to scale up
  - The more peers the better it works
- Cons
  - Less safe
  - What about privacy?
  - If nobody shares a file, it is “lost”
  - Free-riders