

## Ubinet master – CDWN Module

### Exercise session : Content delivery and Video streaming

#### Exercise 1: Streaming

1. Globally, consumer IP video traffic is expected to be what share of total traffic by 2018? (rather 50% or rather 80%)
2. What are the Quality of Service metrics that impact the quality of video streaming?
3. What are the reasons for the predominance of HTTP-based streaming?
4. Important Quality of Experience metrics for streaming of stored videos are?
5. In non-HAS transmission, what are the pros and cons of the server sending at full rate (possible a rate higher than the encoding rate of the video)?
6. What is the principle of HTTP Adaptive Streaming (HAS)?
7. Upon a client' request, what are the two main steps leading to the DNS response from the CDN's DNS server?

#### Exercise 2: Bloom filters

1. Express the false positive probability  $p$  of a Bloom filter with the number of elements  $n$ , the number of bits  $m$ , and the number of hash functions  $k$ .
2. Find the expression of  $k$  which minimizes the false positive probability, all other parameters given, and express the corresponding value of  $p$ .
3. Dimensioning the Bloom filter: Consider a typical example where a single server is likely to see  $n = 40$  million objects and we are willing to tolerate a false positive probability of 0.1%. What are the minimum value of  $m$  and the corresponding value of  $k$  to satisfy these constraints?

#### Exercise 3: Web content

We are first going to analyze the delivery of webpage content. Then we look at a YouTube video delivery in the next exercise.

1. Open a web browser. Then launch a Wireshark capture with Capture->Options, untick Promiscuous mode and all name resolutions (bottom right corner).
2. Enter [www.huawei.com](http://www.huawei.com) in the web browser, then stop the capture. Analyze in detail the the sequence of DNS request/response you get. Write down the IP addresses of the web server you are directed to.
3. Enter the IP address of the selected server in <http://whois.domaintools.com> and <https://www.iplocation.net/> . What do you observe?

4. Search [www.huawei.com](http://www.huawei.com) from [www.whatsmydns.net](http://www.whatsmydns.net) . What do the resulting IP addresses correspond to? What are their common point and what can you deduce?
5. Perform the same search with those addresses in the [www.iplocation.net](http://www.iplocation.net) . What can you say?

#### Exercise 4: Video streaming from YT

1. Turn off the volume of your computer. From the YT homepage, do a search on any clip or music group (popular enough so that the search returns of few results, ex: U2,...). DO NOT CLICK. Then pick out the video you will click later on, and identify a specific detail (such as what follows “by” right below the video title).
2. Firefox-> Options-> Developer-> Source code. Then do a search on the above detail, and find on the corresponding line the address mentioned in href=watch?.... Write it down.
3. Firefox-> Options-> Developer-> Network. Launch a Wireshark capture as above. Then click on the video. Once it starts to play, pause it, and stop the Wireshark capture.
4. Each line of the network console represents a HTTP request+HTTP response, the details are visible when clicking on a line. What is the name of the server serving the biggest HTTP transactions (video)?
5. Click on the GET line where the requested file (column file) is the watch?... above. Analyze the headers, then go in Params, then in Response. What can you notice in view of question 4's answer?
6. Get the corresponding IP address of this server in the Wireshark capture, and look it up on [www.iplocation.net](http://www.iplocation.net) . What can you say?
7. Search the server name from [www.whatsmydns.net](http://www.whatsmydns.net) . What is striking? This shows that YT does not manage its CDN the same way Akamai does. To explain the result you get, look for information on “anycast”.