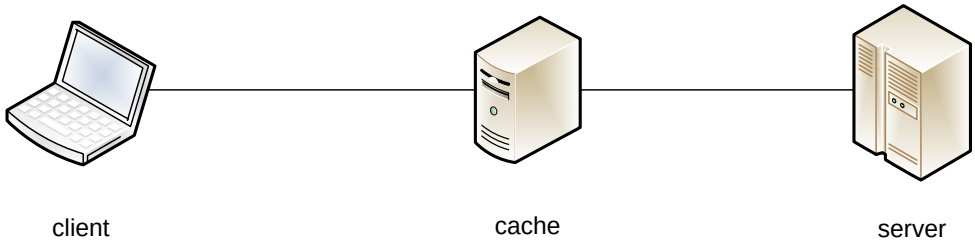
COMPSCI 711 Assignment 1

Due date: 21:00 11th September

The purpose of this assignment is to understand the techniques used by the CDN in reducing the amount of data transmission and practice developing distributed applications.

The system consists of three components as shown in the figure below.



The server provides a service that allows users to browse and download files. The cache caches the data previously downloaded by the client. It should be assumed that the three components reside at different locations. The client program interacts with the server through the cache. That is, when the client wants to browse the list of files available on the server or to download a file from the server, the client's requests are sent to the cache first and the cache forwards the requests to the server. Similarly, the server also sends the replies to the clients through the cache.
Your implementation can be in either C# or Java. Client, cache and server MUST be implemented as separate programs.

Part 1 (50 marks)

In this part, you are required to implement the client program, the cache and the server. The requirements for the three programs are as below:

- The client program should provide a GUI interface that (a) allows the user to display the list of files that are available on the server, (b) allows the user to select a file from the list of available files to download, and, (c) allows the user to display the contents of the downloaded file.
- The cache should cache the files previously downloaded by the client.
    - If the user requests for a file that has the same name as a previously downloaded file, the cached copy of the file should be returned to the user.
    - The cache should keep a log to record of the activities of the cache. For each user's file downloading request, the log should indicate whether the request is satisfied by a cached file or the requested file needs to be downloaded from the server. For example, when a user's request is received, the following log entry might be created:
      user request: file xyz at 10:27:00 2016-07-01
      response: cached file xyz
      or
      user request: file xyz at 10:27:00 2016-07-01

response: file xyz downloaded from the server

- The cache should provide a GUI interface that allows the user to view the contents of the cache's log and the list of files that are cached on the server.
- The interface should provide a function (e.g. a clear button) that allows the files in the cache to be cleared (i.e. deleted).
- It should be assumed that the cache has sufficient space to hold all the downloaded files. That is, you do not need to consider cache replacement policy.

- The server program should provide (a) an operation that allows the user to download a file with a given name, and, (b) an operation that lists the names of the files available on the server.

Part 2 (30 marks)

In this part, you are required to implement the client program, the cache and the server. The cache and the server should allow fragments of the files to be cached. In your implementation, the fragmentation of the files should be carried out automatically. That is, the users do not need to rewrite the files for caching purpose. The requirements for the client program are the same as in part 1. The requirements for the cache are as below:

- When a user requests for a file, if there are some cached data that can be used to construct the requested file, the cached data should be used, and, only the data that do not exist on the cache should be downloaded from the server.
- The cache should keep a log to record of the activities of the cache. For each user's file downloading request, the log should indicate the percentage of the file that is constructed using the data cached on the server. The percentage is defined as "the size of the cached data used to construct the file / the size of the file" where the size is measured in bytes. For example, when a user's request is received, the following log entry might be created:
  user request: file xyz at 10:27:00 2016-07-01
  response: 82% of file xyz was constructed with the cached data
- The cache should provide a GUI interface that allows the user to view the contents of the cache's log and the contents of the data being cached on the cache server.
- The interface should provide a function (e.g. a clear button) that allows the files in the cache to be cleared (i.e. deleted).
- It should be assumed that the cache has sufficient space.

For the server program, in addition to the requirements specified in part 1, the server program should also provide operations that are necessary to allow the cache to download fragments of the files.

The files to be downloaded can be any type of files, e.g. text, image, video, etc. The mark for this part that you gain depends on whether the scheme that you use can maximize the reusable data on the cache.

Report (20 marks)

Write a report about your implementation. Your report should include the following.

(a) Clearly indicate whether you have tested your programs on a lab machine.
(b) Instructions on how to run your programs.
(c) For part 2, describe the techniques that you use to determine which portions of a file need to be downloaded from the server. Compare and contrast the techniques that you used in part 1 and 2 of the assignment in terms of the response time perceived by the user, the amount of network bandwidth that can be saved, and the amount of computation being carried out by the cache and the origin server.

Save your report as a PDF file. Name it as *report.pdf*.

Submission

You MUST test your programs on a lab machine. If your program does not run on a lab machine, you will get NO marks.

Pack your implementations and report into file A1.zip. Submit A1.zip using the assignment dropbox.

NO email submission will be accepted.