Computer Network
Final Project
Cache Proxy Server

CSI4106-01

Fall, 2016

What is the Cache Proxy server?

- **Your AA#4 of Project 3** will answer.
  - https://en.wikipedia.org/wiki/Proxy_server
- A nice example: CDN Service.
- A cache server can be implemented anywhere.
- Cache Position (Conceptually, Client to Server)
  - (Local – Forward) – Gateway – (Reverse – Server)
- **Intermediary Proxy Server**
  - **Forward / Reverse and explicit servers (CDN's cache servers everywhere)**

Our cache server in this project

➔**Forward-like cache server**

- Based on Ideas of Project 2 and 3
- Cache Replacement Policy
  - We use LRU (Least Recently Used) in this project
  - https://en.wikipedia.org/wiki/Cache_replacement_policies#LRU
- HTTP 1.0/1.1 (Not HTTPS)
- **Performance-oriented (Multithreading)**

Mandatory Assignment *"120pts"*

- Write the code of web cache proxy server
- Implement Required Functions (1)~(2)

```
(Format)   ./run.sh port maxConn maxSize
(Example)  ./run.sh 9001 20 16

Cache Replacement Policy: LRU (only this algorithm)

maxConn: Maximum Connection Count (Concurrently Working)
    > example = 20
    > 0 for infinite connections
maxSize: Maximum Total Cache Size (Unit: MiB)
    > example = 16
    > 0 for infinite caching
```

Required Functions
(1) Multithreaded Transparent Proxy

- Refactor or finish your transparent proxy (Project 3)
- Make your proxy server **multithreading-supported**
- **(Tip) You can use any kinds of code for multithreading implementation.**
  - As this class is not Operating System ☺
- **(Tip) For those who use Virtual Machine,**
  - Try Vmware/Hyper-V not VirtualBox (Slow)

Required Functions
(2) Logging on Command Line

```
------------------------------------------------
2 [Conn: 5/20] [Cache: 12.34/16MB] [Items: 22]

[CLI connected to 127.0.0.1:4994]
[CLI ==> PRX --- SRV] @ 22:27:14.712
  > GET cs.yonsei.ac.kr/a.js
  > Mozilla/5.0 (Windows NT 6.1; WOW64)
[SRV connected to cs.yonsei.ac.kr:80]
################## CACHE MISS ##################
[CLI --- PRX ==> SRV] @ 22:27:15.712
  > GET yscec.yonsei.ac.kr/a.js
  > Mozilla/5.0 (Linux; Android 4.4.2; Nexus 4)
[CLI --- PRX <== SRV] @ 22:27:18.331
  > 200 OK
  > application/javascript 3858bytes
################ CACHE REMOVED ################
  > abc.com/def.jpg 0.25MB @ 22:11:33.266
  > This file has been removed due to LRU !
################## CACHE ADDED ##################
  > yscec.yonsei.ac.kr/a.js 0.11MB @ 22:27:18.331
  > This file has been added to the cache
################################################
[CLI <== PRX --- SRV] @ 22:27:18.712
  > 200 OK
  > application/javascript
# 4000ms
[CLI disconnected]
[SRV disconnected]
```

- **This is an example logging format.**
- **You can modify the format if you want.**
- **But this does not mean you can omit detail information!!**

```
------------------------------------------------
3 [Conn: 5/20] [Cache: 12.20/16MB] [Items: 22]

[CLI connected to 127.0.0.1:4994]
[CLI ==> PRX --- SRV] @ 22:27:20.112
  > GET cs.yonsei.ac.kr/a.js
  > Mozilla/5.0 (Windows NT 6.1; WOW64)
[SRV connected to cs.yonsei.ac.kr:80]
@@@@@@@@@@@@@@@@@@ CACHE HIT @@@@@@@@@@@@@@@@@@@@
[CLI <== PRX --- SRV] @ 22:27:20.666
  > 200 OK
  > application/javascript
# 551ms
[CLI disconnected]
[SRV disconnected]
```

Additional Assignments

- Improve the performance of your proxy server.
- **Ideas**
  - **Compression (gzip)**
  - **Chunking (Transfer-encoding)**
  - **Persistent Connection (Socket-reuse)**
- Score
  - 1 component implemented **+20pts**
  - 2 components implemented **+45pts**
  - 3 components implemented **+80pts**

Additional Assignments

- Parameters (Can be enabled at once / one by one)
  - `Compression: -comp`
  - `Chunking: -chunk`
  - `Persistent Connection: -pc`

```
(Format)  ./run.sh port maxConn maxSize [-comp,-chunk,-pc]
(Example) ./run.sh 9001 20 16 -comp -pc

-comp,-chunk,-pc : Order Insensitive!!

For example, if we want to enable compression and
persistent connection on your proxy server,
We will try ./run.sh 9001 50 128 -comp -pc
```

Deliverables (1) *(without folder)*

`[c|u]_TeamName_4.zip`

c=CentOS, u=Ubuntu

e.g. `c_HelloWorld_4.zip`

- **readme.txt** *(follow the example format)*
- **project_4.[py|c]**
  - Your code with **detail comments block by block**
- **run.sh**
  - This makes your code run
- **setup.sh**
  - This should install dependencies or compile your code
- **report.pdf** *(follow the NEW format)*

Report Format *(report.pdf)* *only 1 summary page*

- Team Name / Team Members with ID **(Introduction)**
- How your proxy server works **(Diagram)**
- Specify what you have implemented
- Performance Comparison **(Chart)**
  - (e.g.) Dumb Proxy vs Multithreaded vs AA1 vs AA1+2 vs AA1+2+3...
- Performance Criterion **(Elapsed Time, Memory Use...)**
- What you learned by this project **(Conclusion)**
- **The link of your demonstration video clip on Youtube**
- Your report.pdf **should include ONE EXTRA page to describe your own logging format**.

Deliverables (2)
Demonstration Video

- Directions
  - Commentary with your voice in Korean or English.
  - Max. 10minutes. [over HD Quality]
  - Upload your video on Youtube!
- **This clip is the Proof of your proxy server.**
  - Any experiments which your film does not include or which is insufficient to prove the satisfaction of requirement will be considered that your program does not satisfy the corresponding requirements.
  - Only Screen Capture ➔ 0pts (not allowed)

Video clip scenario (example)

- You implemented “Compression and Chunking”
- Your video shows terminal for real-time logging, and browser screen.
- All experiments are demonstrated one by one with your comment
- (e.g.) A scenario that Compression is more effective than other techniques.
  - Before and after, elapsed time, memory use and so on..

Directions

- **Single or Two-members as a team Project**
- You should follow the file and **logging** format
- Language: **C or Python**
  - **C: gcc 4.8.5**
  - **Python: Python 2 (>=2.7.5) or Python 3 (>=3.5.2)**
- OS
  - **CentOS 7 (>=7.2)**
  - **Ubuntu 14.04.4 LTS (only this version)**
- You must use only ***internal*** libraries.
- **Any 3rd party framework: NOT ALLOWED**

Due Date / Delay Policy

- **DUE DATE (16days)**
  21/Dec/2016 13:00:00 KST

- **Delay Policy**
  NO-DELAY ALLOWED

Remember...

- **DO NOT COPY CODE**
  - We run Code-plagiarism Program.
  - The fastest way to get 0 points.
- **YOU WILL GET 0 POINTS if you CHEAT**

Score Policy ***(FINALIZED)***

Maximum Score = 120+80 pts

1	Not submitted or not working	**0 pts**
2	Overdue **[NO DELAY ALLOWED]**	**0 pts**
3	Missing Additional Assignments	**-80/-60/-35 pts**
4	**Your Demo Video Clip**	**200 pts**
5	**A 3rd party framework is used (except for Multithreading Code)**	**0 pts**
6	**Over-implementation (Suspicion of Code copy)**	**0 pts**
7	**Missing 1 page summary report**	**0 pts**

- Please use YSCEC Q&A board to leave your question.
- Before you ask a question
  - Check project introduction PDF AGAIN.
  - Check others' Q&A.
- Duplicate questions are ignored.