CN201 – COMPUTER NETWORKS

End of Term Assignment: 2018

This is a group assignment and you are required to work **in groups of 5 students**.

Part 1 : Network Design

Introduction:

To understand the Local and Wide Area Network technologies and protocols and relate them to conceptual models, and to develop knowledge and skills relevant to the design, implementation and configuration of network infrastructure.

The Case:

You have been assigned to design a new network for a company. The company wants you to develop the required LAN and the WAN infrastructure and fully document it. The headquarters (HQ) of the company is located in Colombo and two branch offices are situated at various remote locations in the Island.

There are 80 nodes in HQ and nodes are spread equally over four functional departments namely Management, Sales, Finance, HR & Admin. Each branch has 12 nodes. You have to design the LAN & WAN infrastructure with separate IP subnets for each of the department and each branch.

The IP address available for HQ is 192.168.15.0/24 and 172.16.10.0/24 for all branch offices. WAN links/routers are assigned with 10.1.1.0/28 IP address range.

Tasks:

- Design the network topology in each office/facility LAN, and define and describe the structure of the WAN to interconnect all the aforementioned offices/facilities.
- Design IP address schema and illustrate how you would allocate with given IP ranges.
- Implement proposed network through appropriate network simulation tool such as Cisco packet tracer. (It is sufficient to include two nodes for each subnet of the implementation)

  Note: Assumptions and the decided values should be mentioned clearly in the written report. The choice of devices, topology, resiliency, future needs, cost, technical details of interfaces, cabling, security, backup and disaster recovery should be considered.

Part 2: Proxy Cache

For this part of the assignment you need to develop a small web proxy server which is also able to cache web pages. This can be a very simple proxy server which only understands simple GET-requests. But proxy should be able to handle all kinds of objects, not just HTML pages, images etc.

Following supporting files will be provided to you.

1. **Java code skeleton for proxy server**
2. **Implementation guidelines**

Task 1: Creating Simple proxy
Java code skeleton for proxy server is given and you are required to complete the proxy so that it is able to receive requests, forward them, read replies, and return those to the clients. You will need to complete the classes ProxyCache, HttpRequest, and HttpResponse. The places where you need to fill in code are marked with /* Fill in */. Each place may require one or more lines of code.

****Note:** Make sure you back up code after each task.

Task 2: Add better error handling
The simple proxy which you have completed in task 1 does no error handling. This can be a problem especially when the client requests an object which is not available, since the "404 Not found" response usually has no response body and the proxy assumes there is a body and tries to read it. You need to modify code to so that it can HTTP responses with error codes.

Task 3: Add caching
Add the simple caching functionality to the proxy you completed in task 2 above. You do not need to implement any replacement or validation policies. Your implementation will need to be able to write responses to the disk (i.e., the cache) and fetch them from disk when you get a cache hit. For this you need to implement some internal data structure in the proxy to keep track of which objects are cached and where they are on disk. You can keep this data structure in main memory; there is no need to make it persist across shutdowns.

Deliverables:

(Part 1 & 2)

- **Report:**
    - Should explain your network design together with descriptions of routing/ switching technologies, sub netting, routing and , network implementation
    - Should explain your proxy code with a class diagram.
    - You should justify all your choices
    - Report Length: Not more than 3500 words
- **Network simulation:** Should submit network simulation
- **Proxy server:** Should submit archived and compressed java project.

  Above three deliverables should be uploaded to LMS on or before deadline
- **Demonstration:** Each group has to demonstrate network design and proxy in given time slot. For this you can use only uploaded network simulation and Java project

Assumptions:
If you are not able to learn any information about certain parts of the network, you should be able make valid logical assumptions and justify them.