Vilnius University Faculty of Math and Informatics Software engineering 3 year

Network Project for Teaching and Testing College

**Work Done by:**

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# Project description

Assignment for Computer networking 2 was given to design and implement a realistic networking scheme for a College which is called “Teaching and Testing College” (TTC). Assignment was given for the whole semester.

Project was implemented using a cisco tool Packet Tracer.

## Project requirements

* provide physical and logical TTC network diagrams.
* plan optimal networking equipment.
* plan main servers and their connection to the TTC network.
* there must be a WEB server in server room accessible from everywhere.
* ISP provides Internet cable until room marked "POP/MDF" for your organization.
* organization acquired IP address ranges 193.219.42.0/24 and 2001:77c:fac1::/48;
* you must decide and justify how to reasonably split the TTC network into optimal subnets (VLSM is recommended).
* there must be at least 6 user subnets with external IP addresses from organization IP range.
* network must be implemented with IPv4 and IPv6 addresses.
* provide IP addresses, subnet masks, gateways for each networked devices (you must provide information only for first and last computer workplaces (CW) in each room)
* plan wireless networks for all TTC.
* plan security system which uses IP devices.
* plan additional networked equipment (IP phones, printers ...)
* add ACLs to limit access from possibly dangerous parts of a network to other places.
* there are no plans to expand CW in current locations
* there should be an easy way of expanding network if TTC decides to expand in new locations;

## Description of TTC rooms and required computer workplaces

TTC is in three buildings:

* Main building
  + Ground floor (dimensions 30\*50 m)
    - Server room with Internet inlet
    - Class (12 CW)
    - Class (14 CW)
    - Administration (10 CW)
  + Second floor (dimensions 30\*50 m)
    - Multimedia learning center (16 CW)
    - Design and engineering department (24 CW)
  + Center of Assessment (~100 m distance from TTC)
    - Assessment room (18 CW)
* Cyber security learning center (distance ~1,5 km from TTC)
  + Blue team (defending) room (14 CW)
  + Meeting room (6 CW)
  + Multipurpose / Conference room which may be divided into smaller rooms with configuration options:
    - one big room (56 CW);
    - two medium rooms (28 CW) each.
    - one medium room (28 CW) and two small rooms (14 CW) each;
    - four small rooms (14 CW) each
  + Cyberthreats research lab (30 CW)
  + Meeting room (3 CW)
  + Red team (attacking) room (10 CW)
  + Green team (infrastructure support) room (7 CW)
  + Server room for Cyber security learning center (20 servers, 200 VMs)
  + White team (evaluation) room (5 CW)

# Tasks and their implementation

### Task: provide physical and logical TTC network diagrams;

### Solution:

Network was designed and implemented in Packet tracer, both physical and logical diagrams that can be viewed.

LOGICAL diagram:

A screenshot of a computer

Description automatically generated with medium confidence

Figure Logical view of TTC main building ground floor

A picture containing text, sky, screenshot, day

Description automatically generated

Figure Logical view of TTC main building first floor

Rectangle

Description automatically generated with low confidence

Figure Logical view of the Assessment center

Chart

Description automatically generated

Figure Logical view of CSLC main building ground floor

PHYSICAL VIEW:

Diagram

Description automatically generated

Figure Physical view of the whole building complex

Diagram

Description automatically generated

Figure Physical view of TTC building ground floor

Graphical user interface

Description automatically generated

Figure Physical view of TTC building first floor

Graphical user interface, chart, box and whisker chart

Description automatically generated

Figure Physical view of Assessment center

Diagram

Description automatically generated

Figure Physical view of CSLC building

### Task: plan optimal networking equipment

### Solution:

Keeping in mind the amount of CW needed each individual room in every building of TTC will have a switch in there. There are total of 14( 2960) switches in each rooms. Additional each subnet will also have a switch that is connected to those rooms where the subnet is there total of 7 subnets with 7 (2960) switches. For routing each building will have their own router except for the assessment building. TTC main building will have a Main router(2911) that connects all other routers in the area. This main router will be the connector to the ISP. TTC main building will have 1(2911) router and CSLC building will also have 1(2911) router and 1 for the server room.

In total there will be 4(2911) routers and 19(2960) switches

### Task: plan main servers and their connection to the TTC network

### Solution:

Main servers will located in designated Server rooms both in the main TTC building and in the CLSC building. Each of the server rooms will have a switch(2960) that connects to the router of that building. Due to lack of IP addresses servers will be included in one of the subnets. Currently there is a WEB server located in the POP/MDF room in the main TTC building, which every single device in the network can access. There is also a IoT server in the CLSC building that controls the motion detector and the camera.

### Task: reasonably split the TTC network into optimal subnets

### Solution:

With the help of VLSM the network of 193.219.42.0/24 was split in these subnets

Table

Description automatically generated with low confidence

**A** – CLASSROOM 1, CLASSROOM 2, MULTIMEDIA CENTER, ASSESSMENT ROOM

**B** – BLUE TEAM ROOM, MEETING ROOM(6), LAB, RED TEAM ROOM

**C – CONFERENCE ROOM, MEETING ROOM, SERVER ROOM**

**D** – CENTER OF DESIGN AND ENGINEERING

**E** – GREEN TEAM ROOM, WHITE TEAM ROOM

F – ADMINISTRATION, POP/MDF ROOM

### The ipv6 address was split as following:

**A** – 2001:77C:FAC1::/48

**B** – 2001:77C:FAC2::/48

**C – 2001:77C:FAC3::/48**

**D** – **2001:77C:FAC4::/48**

**E** – **2001:77C:FAC5::/48**

F – **2001:77C:FAC6::/48**

* **Server room in CSLC was created in a different network**

**IP - 193.219.43.0/27**

**IPV6 - 2001:77C:FAC7::/48**

### Task: plan wireless network for all TTC

### Solution:

The plan to have wireless network in the TTC is this. The Ground floor of main TTC building will have two wireless routers: 1 in the Classroom and 1 in the Administration.

Both first floor and the Assessment center will have 1 router positioned in the middle of the buildings for better connection

CLSC building will have 3 wireless routers separated from each other in equal distance to cover most of the building. 1 router will be in the conference room, 1 in the server room and 1 in the Blue team’s room. This will make sure all of the building is covered.

### Task: plan security system which uses IP devices

### Solution:

Security will be implemented using Motion detection sensors and cameras. One sensor and one camera is positioned in the conference room. These sensors and cameras are controlled by IoT server which is positioned in the server room of CLSC building. To expand the security system in the TTC area, plan is to add both motion detection and cameras to the main TTC building in the Administration room and both of the classrooms and in the first floor. And in the assessment center.

### Task: plan additional networked equipment (IP phones, printers ...)

### Solution:

Currently the TTC area has only a printer connected in the administration room. But adding additional devices should be simple. Plan is to add IP phones, 1 in the administration room and 1 in the Server room for the CSLC. This will make sure there is an established connection between two buildings so they can communicate with each other.

### Task: add ACL's to limit access from possibly dangerous parts of a network to other places

### Solution:

ACL are used to deny or permit access to certain areas in the network. In our project ACLs are important since there are many high priority and important rooms which shouldn’t be allowed to be accessed by everyone. Currently the project has blocks the conference room to access the Research labs since it is a important place in the building. Other plans are to limit access to the Assessment center from students.