Lab Final Project

CPNT219 – Introduction to Networks

Student Names:

Weight: **35%**

Marks: **/100**

Contents

Project Overview

This project allows students to complete a network design, implementation, and troubleshooting using skills gained throughout the course.

The project is broken into 5 (five) phases, listing the very high-level requirements for each stage. Reading and understanding each requirement is essential to ensure the project is completed accurately.

1. This is a group project, not an individual.
2. Your team will create a network design for a company as described in the scenario below. If needed, review material covered on network design.
3. Divide the tasks among team members. Each team member is expected to participate and contribute to the best of their ability.
4. Each student will be responsible for managing one site (city) within a company network. Students will use the simulation software Packet Tracer to demonstrate the requirements.
5. Project work is expected to be done outside of regular class hours. This project requires a substantial effort, as reflected in the time between group formation and project presentations.
6. A progress check-in with the instructor will take place before the final Presentation. An instructor check-in will announce the detail. Fail to present the check-in 0 mark as a result.
7. Project presentations will be scheduled for Week 14. Groups will have a maximum of 20 minutes, and every team member will be presenting for an equal amount of time. Every student will demonstrate their own work as a part of the Presentation. Ensure that the audio and webcam are enabled during the Presentation. Fail to show the Presentation 0 mark as a result

Note: Each Presentation will stop at 20 minutes, and marking will be done on whatever material was presented.

8. Each student will present the demo of their own site using commands that students have learned throughout the semester.
9. Grading requirements are outlined in the marking criteria.
10. Before the presentations:
    - Each team is required to submit the Packet Tracer file and Project Report document on Brightspace.
11. Late submissions are not accepted.

Scenario

<inset your company Name> is a start-up company located in Calgary that needs a network to be designed and implemented by a team of IT Administrators. They have contracted you to set up their infrastructure with configurations and services. You are asked to provide a proof of concept of the

network you wish to build prior to implementation using Packet Tracer. As an IT Administrator, you are responsible for ensuring a successful launch of the new company. While the company will let you make many decisions, they have specific requirements.

General Requirements:

- This project must complete in a group, not an individual.
- It is expected that all students will contribute equally to all aspects of this project.
- Students who have difficulty working with their group must inform their instructor immediately a problem occurs so that a resolution to the difficulty can be made. If no such contact is made, it will be assumed that no problem exists, and no later student protests will be accepted.
- Much of the work can be based on research carried out by reading the Cisco Online Curriculum, but other resources can be used. All information obtained must be fully referenced.

Phase 1: Network Logical Design and Allocating IP Addressing Scheme

1. All teams must follow a logical and appropriate naming convention for the device names,site names, LAN names, usernames, and domain names.
2. Subnetting Requirements:
   - 2.1. The company appreciates efficiency and address conservation in design. To minimize wasted address space, they have requested VLSM to be used when appropriate.
   - 2.2. All devices must have an IP address.
   - 2.3. Each team member is responsible for managing one (1) site (Note: site = city), so the number of sites will depend on the number of team members (e.g., a team of 3 students will have 3 sites, while a 4-student squad will have four sites.
   - 2.4. Within site, students create networks based on the number of team members; for example, (e.g., a team of 3 students will have three networks, while a 4-student team will have 4 networks.
   - 2.5. Your instructor will assign a team number based; you will find the number of hosts requirements in each LAN for your site in the Appendix "Subnets." Each student is responsible for subnetting all devices on their own site.
   - 2.6. Site requirements:
     - Calgary (HQ)
     - Internet connection for your company through the Calgary site only.
     - Each site should have at least one dedicated router. Additional interfaces can be added to the routers to support the required LAN and WAN connections.
     - Use at least one switch for each LAN.
     - 5 PCs on each LAN.
     - At least one network of a site must configure Wireless technology.
     - Documentation is necessary – a person who is responsible for each site

2.7. Use the following network addresses – Indicate on subnetting tables who is responsible for what site :

Note: Each member is doing the subnetting for the site that the person is assigned - Indicate on subnetting tables who is accountable to what site:

- Site 1: IPv4-10.xx.0.0/18, IPv6- 2001:db8:acad:xx::/48 (xx is last 2 digits of SAITstudent ID)
- Site 2: IPv4-10.yy.0.0/19, IPv6- 2001:db8:acad:yy::/48 (yy is the last 2 digits of the student's year of birth)
- Site 3: IPv4-10.zz.0.0/18, IPv6- 2001:db8:acad:zz::/48 (zz is the last 2 digits of the year of birth of the team lead)
- Site 4: IPv4-10.aa.0.0/ 19, IPv6- 2001:db8:acad:aa::/48 (aa is the last 2 digits of the student's day of birth)
- Site 5: IPv4-10.bb.0.0/ 19, IPv6- 2001:db8:acad:bb::/48 (aa is the last 2 digits of the student's month of birth)
- WAN connections between the routers using the most appropriate and most efficient use of IP addressing

2.8. Use the first usable IP address for the default gateways.

2.9. Switches will use the last usable IP address for the management SVI.

2.10. Hosts can use any available addresses.

2.11. Create a VLSM Subnetting table and an addressing table showing the subnets meet the company requirements using a VLSM design.

VLSM Subnetting Table – Required ALL Subnet Networks.

Network Name	Hosts Needed	Total available IP Addresses allocated	Prefix	Network Address	First Usable Host Address	Last Usable Host Address	Broadcast Address	Subnet Mask

- A sample table layout for recording the VLSM design. Include all LANs and WANs. Provide IP address information for devices, including Routers, Switches, and End devices. This will assist with design and development activities and be used when configuring Switches, Routers, and End Devices.

Network Addressing Table

Device Name	Interface	IP Address	Subnet Mask	Default Gateway Address

Phase 2: Cabling and Host Configuration

1. Using Packet Tracer, design the network as per Phase 1. Use the appropriate cables between devices, and select the port numbers of your choice. **Label all the port numbers** on the Packet Tracer.
2. Configure all the end devices with an IP address, subnet mask, and default gateway using the tables created in Phase 1.
3. Use a router model – 2811, and you will need to find the appropriate modules to add to the routers to provide enough interfaces.

Note: no use of serial cable. Choose a proper cable between site-to-site connections.

Phase 3: Switch Configuration

1. Configure basic IOS configurations
2. Devices secured with passwords using the highest
3. SSH access to all Layer 2 switches
4. Apply the best security practices if applicable
5. Use model 2960 switch
6. Verify communication – Ping commands should work between PC to switches within the same network.

- Tests /Verification
- At this point, Ping works within LAN only

Phase 4: Router Configuration - IPv4

1. Configure basic IOS configurations.
2. Devices are secured with passwords using the highest.
3. SSH access to all layer 3 devices.
4. Simple **static and/or dynamic routes. No default routes** for all connections; If you do, deduct marks. (all networks should be reachable by all other networks).

5. Apply the best security practices if applicable.
6. Packet Tracer - Logical diagram with the **device names** and **IP addresses labeled (both IPv4 and IPv6)**.
7. Verify communication between hosts from different networks – Ping IPv4 commands should work from end to end.

- Tests /Verification
- To ping to work from end to end, IPv4 Routing is configured correctly on every site.

Phase 5: Configure IPv6

1. Come up with your IPv6 address scheme for Global Unicast and Link-Local – remember to follow the IPv6 addressing structure.
2. Simple **static routes**. No default routes for all connections; if you do, deduct marks. (all networks should be reachable by all other networks).
3. Packet Tracer - Logical diagram with the **device names** and **IP addresses labeled (both IPv4 and IPv6)**.
4. Verify communication between hosts from different networks – Ping IPv6 commands should work from end to end.

- Tests /Verification
- To ping to work from end to end, IPv6 Routing is configured correctly on every site.

Presentation Requirements

- The Presentation consists of two parts:
  1. Presentation
  2. Demonstration
- **About 20 minutes** is allocated to each group, and every single one of you is presenting during the Presentation

Note: Fail to attend the Presentation and Demonstration will receive 0 marks for the Presentation.

Project Report Submission

Submit the Packet Tracer and The Project Report document to the Project on D2L by **Friday, April 21, at 4:00 pm.**

A single copy from each group (Completed Packet Tracer and Project Report Document):

1. Packet Tracer file as per the requirements.
1. Project Report document – must be a **single document**:
   a. The title page includes the course name, the name of the project, all the team members, and the date.
   b. Table of contents with page numbers. (Organize the contents of the report according to phases.)
   c. Project design document - detailed network topology description and the team's decision-making.

d. VLSM Subnetting Table and the Network Addressing Table for the project.
e. Provide all the passwords used in the project.

Marking Rubric

Criteria	Level of Achievement					
	Very Poor (0-49)	**Poor (50-54)**	**Fair (55-65)**	**Good (65-79)**	**Very Good (80-89**	**Excellent (90-100)**
Technical Accuracy and Completion (70%)	Phase 1— Phase 6 did not meet the minimum requirements	Phase 1— Phase 6 met some of the minimum requirements.	Phase 1— Phase 6 met the minimum and no additional requirements.	Phase 1— Phase 6 met the minimum requirements and some of the additional requirements	Phase 1— Phase 6 met the minimum and all of the additional requirements	Phase 1— Phase 6 met minimum requirements, all of the additional requirements, and additional non-listed requirements
A demo during the Presentation (15% -)	A demo did not meet the minimum requirements.	A demo met some of the minimum requirements.	A demo met the minimum requirements and none of the additional requirements.	A demo met the minimum requirements and some of the additional requirements.	A demo met the minimum and all of the additional requirements	A demo met minimum requirements, all of the additional requirements, and additional non-listed requirements
Presentation /Project Report (15%)	Student's understanding of the area appears very low, and the demonstration delivery is unintelligible	Student's understanding of the area appears low, and the demonstration delivery is almost unintelligible	Student's understanding of the area appears moderate, and the demonstration delivery is intelligible	Student's understanding of the area is good, and the demonstration delivery clear, well-paced, and on time	Student's understanding of the area is very good, and the demonstration delivery is very clear, very well-paced, and very good timing	The student's understanding of the area is excellent, and the demonstration delivery is exceptionally clear, perfectly paced, and to excellent time

	A lot of spelling and grammar errors Poorly organized No eye contact Too Fast or slower speed of speaking during the Presentation Reading off from notes	Some spelling and grammar errors Poorly organized No eye contact Too Fast or slower speed of speaking during the Presentation Reading off from notes	Minor spelling and grammar errors Poorly organized No eye contact Too Fast or slower speed of speaking during the Presentation Reading off from notes	Minor spelling and grammar errors Poorly organized No eye contact Too Fast or slower speed of speaking during the Presentation Reading off from notes	No spelling and grammar errors Good organized Good eye contact Good speed of speaking during the Presentation Not Reading off from notes	No spelling and grammar errors Good organized Good eye contact Good speed of speaking during the Presentation Not Reading off from notes

Appendix: Subnets

	Site 1				Site 2				Site 3				Site 4			
	LAN 1	LAN 2	LAN 3	LAN 4	LAN 1	LAN 2	LAN 3	LAN 4	LAN 1	LAN 2	LAN 3	LAN 4	LAN 1	LAN 2	LAN 3	LAN 4
1	1061	164	346	19	231	42	1028	52	67	188	1350	183	11	59	876	1318
2	1027	107	339	61	195	44	1322	47	27	186	962	107	20	28	926	1326
3	1092	115	327	82	206	43	1076	55	27	182	782	121	5	66	780	1307
4	1289	133	337	66	236	9	1389	62	63	216	670	135	18	43	790	1766
5	1081	112	263	36	212	40	1349	41	90	172	1346	195	7	22	649	1614
6	1030	164	295	92	247	10	994	41	94	195	1029	197	25	55	796	1367
7	1107	161	284	72	208	35	1052	45	62	220	927	143	18	19	805	1451
8	1357	137	341	21	218	40	1397	58	84	211	1074	143	24	22	782	1483
9	1268	120	291	49	243	29	1447	50	74	162	1431	199	9	21	641	1806
10	1349	128	337	83	236	16	1215	62	89	191	898	140	20	40	883	1429
11	1093	119	315	63	200	20	1254	60	35	214	1263	182	5	25	939	1870
12	1172	135	323	37	234	22	1032	53	50	151	911	213	16	92	680	1465

13	1387	132	344	35	255	35	1191	57	91	226	1343	198	18	37	976	1460
14	1037	125	252	69	227	15	1388	58	84	152	859	163	11	50	948	1813
15	1035	108	329	84	209	29	995	56	59	205	647	118	11	16	930	1678
16	1167	147	316	22	228	17	1260	52	60	198	854	122	5	56	650	1923
17	1161	163	265	85	236	7	1106	59	34	164	1160	131	15	40	854	1905
18	1064	143	268	97	239	20	1260	57	47	247	657	125	12	19	990	1859
19	1379	123	299	77	198	47	1023	60	46	233	1386	202	21	55	750	2189
20	1093	154	308	53	248	46	1300	39	63	167	1107	102	24	79	777	1947