

Sri Lanka Institute of Information Technology



Group Assignment

Network Design and Development

2022

Advance Networking Technologies – IE2052

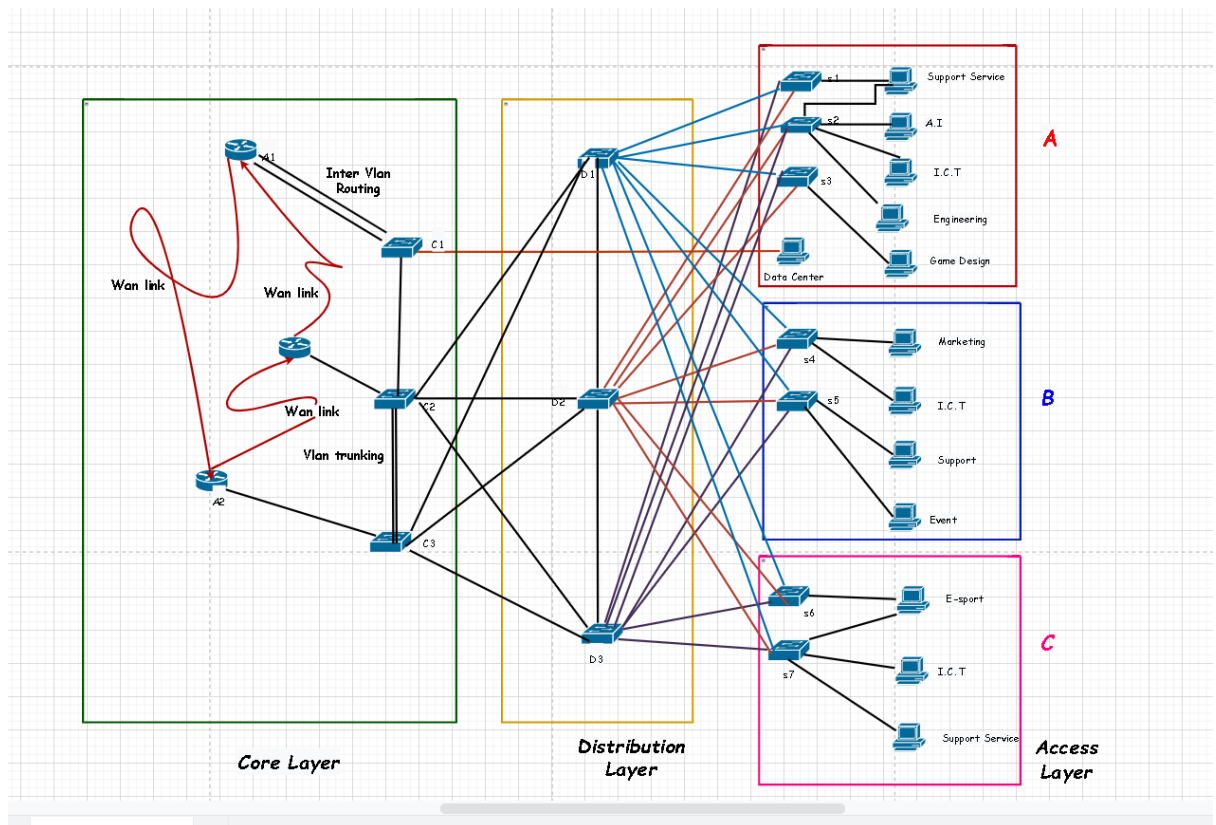
B.Sc. (Hons) in Information Technology Specializing in Cyber Security

Group Details

Group Number:

	Student ID	Student Name	Email
1	IT20660116 (Group Leader)	Sulaxshayan.N	IT20660116@my.sliit.lk
2	IT20643904	Munasingha R.S.I	IT20643904@my.sliit.lk
3	IT20647346	GNS SENARATHNE	IT20647346@my.sliit.lk

1. Design a three-layer network topology according to the above given specifications. Requirements such as redundancy and port aggregation must be considered in the design.



2. Analyze the security requirements of such a network and ensure they are considered in the design

ANALYZING SECURITY REQUIREMENTS

- Install security patches regularly or daily, if possible, to keep software up to date.
- Establish a written security policy for your business.
- Unused services and ports should be turned off.
- Use complex passwords and change them frequently.
- Manage device access physically.
- When possible, avoid using insecure HTTP websites, especially for login screens; instead, use HTTPS.
- Make regular backups and test the files you've backed up.
- Inform staff about social engineering threats and create standards for verifying IDs over the phone, via email, and in person.
- Protect sensitive data with encryption and passwords.
- Install firewalls and other security devices and software.

3. Create an appropriate IP addressing plan and document it.

Name	Hosts Needed	Hosts Available	Network Address	Slash	Mask	Usable Range	Broadcast	Wildcard
Support Services	53	62	172.168.0.0	/26	255.255.255.192	172.168.0.1 – 172.168.0.62	172.168.0.63	0.0.0.63
E-Sport	50	62	172.168.0.64	/26	255.255.255.192	172.168.0.65 – 172.168.0.126	172.168.0.127	0.0.0.63
Games Design	48	62	172.168.0.128	/26	255.255.255.192	172.168.0.129 – 172.168.0.190	172.168.0.191	0.0.0.63
ICT	32	62	172.168.0.192	/26	255.255.255.192	172.168.0.193 – 172.168.0.254	172.168.0.255	0.0.0.63
Event	32	62	172.168.1.0	/26	255.255.255.192	172.168.1.1 – 172.168.1.62	172.168.1.63	0.0.0.63
Marketing	16	30	172.168.1.64	/27	255.255.255.224	172.168.1.65 – 172.168.1.94	172.168.1.95	0.0.0.31
Engine Development	12	14	172.168.1.96	/28	255.255.255.240	172.168.1.97 – 172.168.1.110	172.168.1.111	0.0.0.15
Data Center	8	14	172.168.1.112	/28	255.255.255.240	172.168.1.113 – 172.168.1.126	172.168.1.127	0.0.0.15
AI	8	14	172.168.1.128	/28	255.255.255.240	172.168.1.129 – 172.168.1.142	172.168.1.143	0.0.0.15
WAN 1	2	2	172.168.1.144	/30	255.255.255.252	172.168.1.145 – 172.168.1.146	172.168.1.147	0.0.0.3
WAN 2	2	2	172.168.1.148	/30	255.255.255.252	172.168.1.149 – 172.168.1.150	172.168.1.151	0.0.0.3
WAN 3	2	2	172.168.1.152	/30	255.255.255.252	172.168.1.153 – 172.168.1.154	172.168.1.155	0.0.0.3

4. The hardware devices that will be used to implement the network must be selected and justified.

Totally, We have used **seven** access layer switches, **three** distribution layer switches and **three** routers and **three** core layer switch. Those are implemented in this form,

Location A : 3 switches

- S1 for Support service, another s2 switch for A.I, I.C.T, Engineering respectively. Then S3 switch for Game Design.
- We connect to the Data center directly from distribution layer switch. The reason is, to get access speed 10GB.

Location B: 2 switches

- S4switch is used to connect I.C.T , marketing Department
- S5 swicth is used to connect Support, Event respectively.

Location C: 2 Switch

- S6, S7 switches are used to connect E-sport, I.C.T, Support Service Respectively.

In **distribution** layer,

- D1 switch is used to connect Data center end-devices. Because Data Center needs 10GB access speed to each device.

In **Core** layer,

We have used **Two** router. The reason is , reduce the load of traffic and cost of implement also if we decrease the amount of router(exactly one router) we cannot get the expected access speed out from each and every end-devices.

5. Identify 3 layer 2 technologies you will implement in the designed network. Evaluate and justify why the selected technology is suitable for the design proposed by you.

Some of the the layer 2 technologies which we have used here are,

- 1.VLANs
- 2.Mac Addressing
- 3.Lan Switching

- **VLANs**

Virtual Area Network is a subnet which is a subnetted collection of devices from different physical LANs (Ethernet, Wi-Fi). VLANs are usually used to repartition a vast network in order to reduce the network traffic and to manage easily.

VLANs can reduce the traffic of network and make it clean by grouping the devices which frequently communicate each. Devices strewn across many physical networks during peak traffic periods are often handled by network core routers.

The switchers, on the other hand, can handle the traffic more efficiently when we employ VLANs.

VLANs are of two types, namely Static which the admin assigns individual ports in the switch to the VLAN regardless of which device attached to the ports they become members of the VLAN and Dynamic which the admin selects the memberships of VLAN considering the characteristics of the devices using a list consisting physical addresses and network accounts.

- **MAC Addressing**

MAC address aka Media Access Control address is a unique address for networking devices consisting of 48 bits. Also called as the physical address of the device as it is a static address.

The mac address is used in the MAC sublayer of Data link layer according to the IEEE 8.2 standard.

- **LAN Switching**

LAN switching is a form of packet switching in which the data packets are transferred from one PC to another via a network. This is a mostly used technology in network designing as it allows traffic to be sent only where needed. This will upgrade the efficiency of the network while resolving the existing bandwidth issues.

LAN switching will increase the network scalability when demand increases and also every node has an increased bandwidth and performance.

There exist many advantages with using LAN switching including, increased scalability, capability of making many simultaneous connections as all nodes are connected to each other, and there's a low chance of a node to be failed.

6. Identify 3 layer 3 technologies you will implement in the designed network. Evaluate and justify why the selected technology is suitable for the design proposed by you.

Some of the layer 3 technologies which we have used here are,

1. Routing Protocols
2. Access Control List (ACL)
3. ARP

- **Routing Protocols**

Routing Protocols determine optimal network data transfer and communication paths between network nodes using software's and routing algorithms. Also known as routing policy and is able to facilitate router communication and overall network topology understanding. Most of the internet protocols and internet gateway routing protocols are provided interior gateway routing through path or distance vector protocol.

Open Shortest Path First is a link state routing technology which facilitates gateway routing.

BGP v4 is a public internet routing protocol that is implemented using outside gateway routing.

- **Access Control List (ACL)**

A collection of rules which grant or refuse access to a computer network is called an ACL. This allows managers to ensure that devices can't grant access unless it presents the correct credentials.

There are two types of ACLs namely Filesystem ACLs and Networking ACLs.

Switches and Routers have ACLs performing the functions of packet filters in this layer. It determines the way a packet supposed to go through the network by checking the IP address of source and destination ports and the packet's procedure.

Only the authorized users are facilitated to access the devices using a authentication database by the ACL which will make the way of identifying local and remote users and hosts easier.

- **Address Resolution Protocol (ARP)**

ARP is an protocol that connects IP addresses which are constantly changing to a fixed physical address which is also known as MAC address in the LAN.

Every joining new computer/device will have an unique IP address from ARP to use for identification and communication.

Namely there are four types of ARPs as Proxy ARP, Gratuitous ARPs, Inverse ARPs and Reverse ARPs.

ARP is essential because the networked host or computer's software address (IP address) must be translated to a hardware address (MAC address).

Without the usage of ARP, a host would be unable to determine the hardware address of another host.

The LAN has a table or directory that maps IP addresses to MAC addresses for all network devices, including endpoints and routers.