SCHOOL OF COMPUTER SCIENCES

UNIVERSITI SAINS MALAYSIA

CST332 Internet Protocols, Architecture & Routing

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Assignment 1: Technical Proposal

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Chapter 1 Architecture Design

1.1   Network Architecture

Our solution in network architecture for Lemon Corporation is Cisco Hierarchy Model, which has three layers: Core layer, Distribution layer and Access layer. **Core layer** consists of high-speed Multilayer Switches, one in each factory and are configured with EtherChannel among them to provide fault-tolerance and high-speed links. **Distribution layer** allows the management of routing, filtering, and Quality of service (QoS). **Access layer** are the platforms where end devices are connected to the network of company.
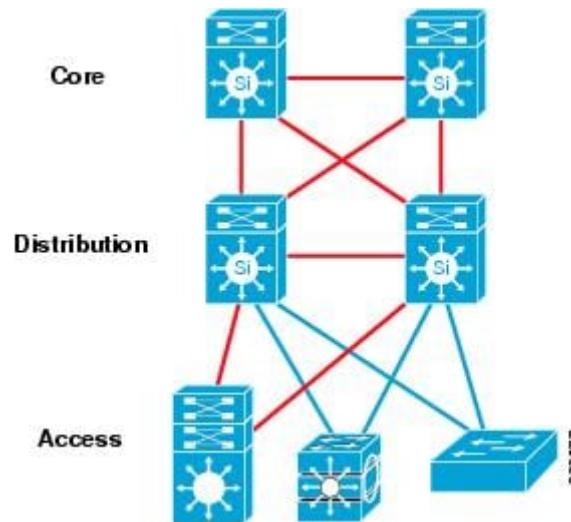
Before connecting the desktops to the company network, each desktop will be given an IP address and default gateway based on the VLAN they are in.

Department	Engineering	Admin	Sales	IT
VLAN	10	20	30	40
Total devices	420	206	128	121
Network Address Block	192.160.10.0/23	192.160.20.0/24	192.160.30.0/24	192.160.40.0/24
Available Address	510	254	254	254

VLAN99(192.160.99.0/24) will be given to the switches, routers and servers for management.

As all the departments are spanning across all factories and floors, we divide each floor with 4 departments, having switches configured for each department which is not possible for other departments to access it except its own.

Server will reside in 2nd floor in Factory #1. We have also assigned a switch for it in case more servers are needed in the future.
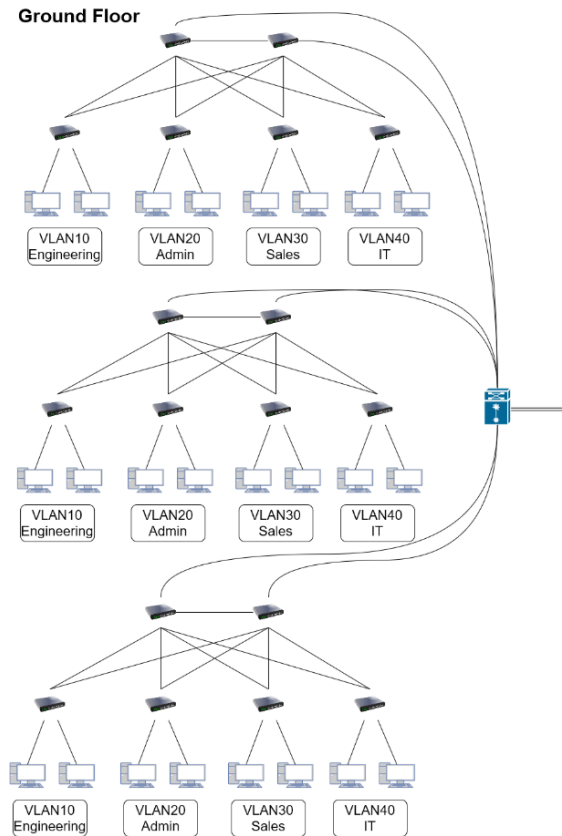
Figure 2.2 : Topology for each factory

Figure 2.3: Topology for Server

Bandwidth is important when multiple or hundreds of devices are trying to access a resource from the same location. We have set up **EtherChannel** between switches and routers that will have heavy traffic to process and send packets as fast as possible.

	Factory #1 MLS	Factory #2 MLS	Factory #3 MLS
Factory #1 MLS	-	3	4
Factory #2 MLS	3	-	6
Factory #3 MLS	4	6	-

Table 2.1: Channel-group for EtherChannel

1.2 Point of Failure

A single point of failure (SPOF) is a weakness in the design, configuration, or implementation of a system, circuit, or component that poses a risk because it could result in a situation where a single malfunction or fault causes the entire system to fail. A single point of failure in a data centre might affect workload availability or perhaps the availability of the entire location, depending on the interdependencies involved in the failure and its location. Security is threatened, and productivity and business continuity suffer.

To counter this, we first had the EtherChannel for fault-tolerance, shall one link fail, it will redistribute the traffics to the remaining links. For every floor in the factory, we assigned at least two switches for the distribution layer and enable trunk between them. This should prevent point of failure, as one link fails, it still can go through other switches to reach the destination. As for the switches in the access layer, we make sure that each of them are connect to at least two switches from distribution layer and enable trunk within them.

1.3 IP Addressing Scheme

Devices	Interface	IP Address	Subnet Mask	Default Gateway
Factory #1				
Main Router	G0/1.10	192.160.10.1	255.255.254.0	N/A
	G0/1.20	192.160.20.1	255.255.255.0	N/A
	G0/1.30	192.160.30.1	255.255.255.0	N/A
	G0/1.40	192.160.40.1	255.255.255.0	N/A
	G0/1.99	192.160.99.1	255.255.255.0	N/A
	S0/0/0	202.160.1.2	255.255.255.0	N/A
MLS	VLAN99	192.160.99.110	255.255.252.0	N/A
ISP	S0/0/0	202.160.1.1	255.255.255.252	N/A
S1	VLAN99	192.160.99.10-11	255.255.255.0	192.160.99.1
S2	VLAN99	192.160.99.12-13	255.255.255.0	192.160.99.1
S3	VLAN99	192.160.99.14-15	255.255.255.0	192.160.99.1
Home Gateway	VLAN99	192.160.99.16-18	255.255.255.0	192.160.99.1
Server	VLAN99	192.160.99.19	255.255.255.0	192.160.99.1
Server Switch	VLAN	192.160.99.20	255.255.255.0	192.160.99.1
Engi Switch	VLAN99	192.160.99.50-55	255.255.255.0	192.160.99.1
Admin Switch	VLAN99	192.160.99.56-61	255.255.255.0	192.160.99.1
Sales Switch	VLAN99	192.160.99.62-65	255.255.255.0	192.160.99.1
IT Switch	VLAN99	192.160.99.66-69	255.255.255.0	192.160.99.1
PC (Engineer)	NIC	192.160.10.10-102	255.255.254.0	192.160.10.1
PC (Admin)	NIC	192.160.20.10-89	255.255.255.0	192.160.20.1
PC (Sales)	NIC	192.160.30.10-64	255.255.255.0	192.160.30.1
PC (IT)	NIC	192.160.40.10-34	255.255.255.0	192.160.40.1
Factory #2				
MLS	VLAN99	192.160.99.111	255.255.252.0	N/A
S1	VLAN99	192.160.99.21-22	255.255.255.0	192.160.99.1
S2	VLAN99	192.160.99.23-24	255.255.255.0	192.160.99.1
S3	VLAN99	192.160.99.25-26	255.255.255.0	192.160.99.1
Home Gateway	VLAN99	192.160.99.27-29	255.255.255.0	192.160.99.1
Engi Switch	VLAN99	192.160.99.70-77	255.255.255.0	192.160.99.1
Admin Switch	VLAN99	192.160.99.78-83	255.255.255.0	192.160.99.1
Sales Switch	VLAN99	192.160.99.84-86	255.255.255.0	192.160.99.1
IT Switch	VLAN99	192.160.99.87-90	255.255.255.0	192.160.99.1

PC (Engineer)	NIC	192.160.10.103-250	255.255.254.0	192.160.10.1
PC (Admin)	NIC	192.160.20.90-175	255.255.255.0	192.160.20.1
PC (Sales)	NIC	192.160.30.65-80	255.255.255.0	192.160.30.1
PC (IT)	NIC	192.160.40.35-96	255.255.255.0	192.160.40.1
Factory #3				
MLS	VLAN99	192.160.99.112	255.255.252.0	N/A
S1	VLAN99	192.160.99.30-31	255.255.255.0	192.160.99.1
S2	VLAN99	192.160.99.32-33	255.255.255.0	192.160.99.1
S3	VLAN99	192.160.99.34-35	255.255.255.0	192.160.99.1
Home Gateway	VLAN99	192.160.99.36-38	255.255.255.0	192.160.99.1
EngiSwitch	VLAN99	192.160.99.91-100	255.255.255.0	192.160.99.1
Admin Switch	VLAN99	192.160.99.101-103	255.255.255.0	192.160.99.1
Sales Switch	VLAN99	192.160.99.104-106	255.255.255.0	192.160.99.1
IT Switch	VLAN99	192.160.99.107-109	255.255.255.0	192.160.99.1
PC (Engineer)	NIC	192.160.10.251-192.160.11.175	255.255.254.0	192.160.10.1
PC (Admin)	NIC	192.160.20.176-215	255.255.255.0	192.160.20.1
PC (Sales)	NIC	192.160.30.81-127	255.255.255.0	192.160.30.1
PC (IT)	NIC	192.160.40.97-130	255.255.255.0	192.160.40.1

1.4 Connecting to Internet

For the devices to connect to internet, we had included an ISP in the demo. ISP and Main router are connected through OSPF, and every device will be able to access the ISP through this configuration.

Simply type google.com in any end devices and you will be able to access the mock google server.

DNS server: 202.1.1.2

1.5 Managing IoT Devices

All floor has a Home Gateway that is used to connect the IoT devices and it's IP address is dynamically assigned by the Home Gateway. Then in the settings of the IoT devices, we have added remote server as the option to manage them. This server is the main server located in the Factory #1.

By accessing the localhost of the server, we can monitor the status of the IoT devices.

Chapter 2 Simulation

A Cisco Packet tracer file is submitted together with this proposal. This simulation is for **demo purpose** only. Network architecture is set up properly in this file, but not all switches and end devices are included.

Below are the username and password used for SSH connections and console. Note that only main router and Multilayer switches are configured with SSH and basic configuration.

No.	Device	Password		SSH	
		Console	Enable	Username	Password
1	Factory1 - HQ	class	class	lemon	class
2	Factory2	class	class	lemon	class
3	Factory3	class	class	lemon	class

To add more **switches** for a department, configure it with below rules that we had determined:

F0/1-21 – switchport mode access

F0/21-24 – switchport mode trunk

Mode access will have VLAN according to the department that the switch will be assigned in, mode trunk will also only allow the same VLAN of the department, add more when you include more than one VLAN type in the same switch.

VLAN99 address can be taken from the address table according to the department, whichever is available in the range that we stated.

To add more **devices** for a department, configure it with below rules that we had determined:

1. IP address: can be taken from the address table according to the department, whichever is available in the range that we stated.
2. Default gateway: 192.160.<department_no>.1