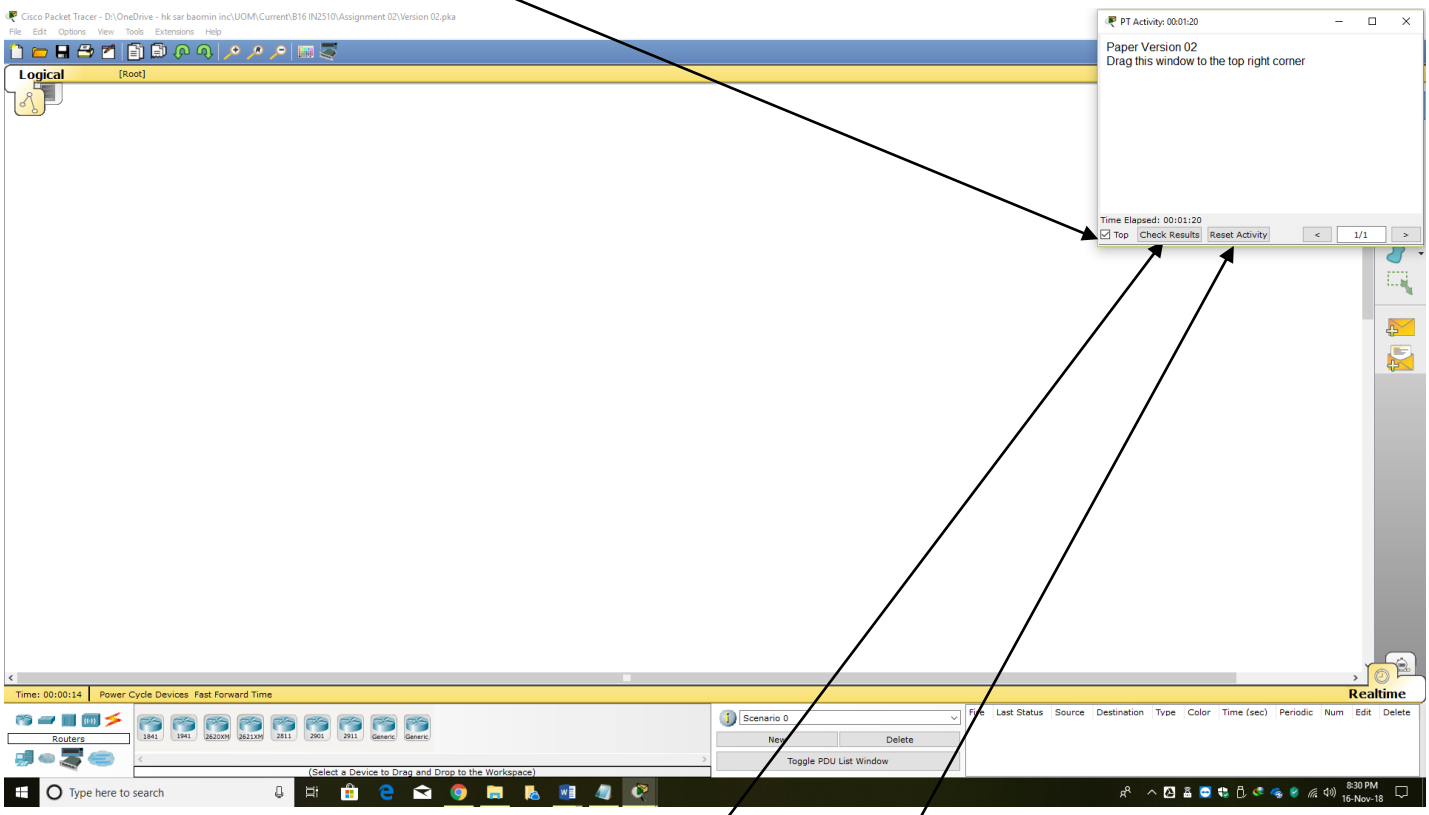
# Faculty of Information Technology, University of Moratuwa
# BSc. (Hons) in Information Technology
# Computer Networks – IN 2510 – Assignment
# Level 2, Semester 2

Instructions to candidates

1. Download the "Assignment03.pka" file from the Moodle and open it.
2. Tick the top icon on the instruction window and drag it to top right corner, and it should be displayed on the monitor during the assessment.




3. Design the network diagram, as mentioned in the question paper. (Note: device types, interface port numbers and labels should be same as in the diagram of the question paper)
4. If your network devices (router, switches, server and PCs) labels do not match with a given diagram, rename those devices' labels as per the given diagram in the question paper. (Note: you can rename labels of devices by clicking on the label name)
5. Do not click "Check Results" and "Reset Activity" buttons in the instruction window of the packet tracer.

Assume that you are the network administrator of the "Dropline Shipping" company. The company has three branches located in Colombo, Kandy and Galle. The Colombo branch has 05 departments (IT, HR, Sales, Accounts and Audit). The Kandy branch has 02 departments (IT and Sales). The Galle branch has 02 departments (IT and Sales). The company needs to create the following VLANs.

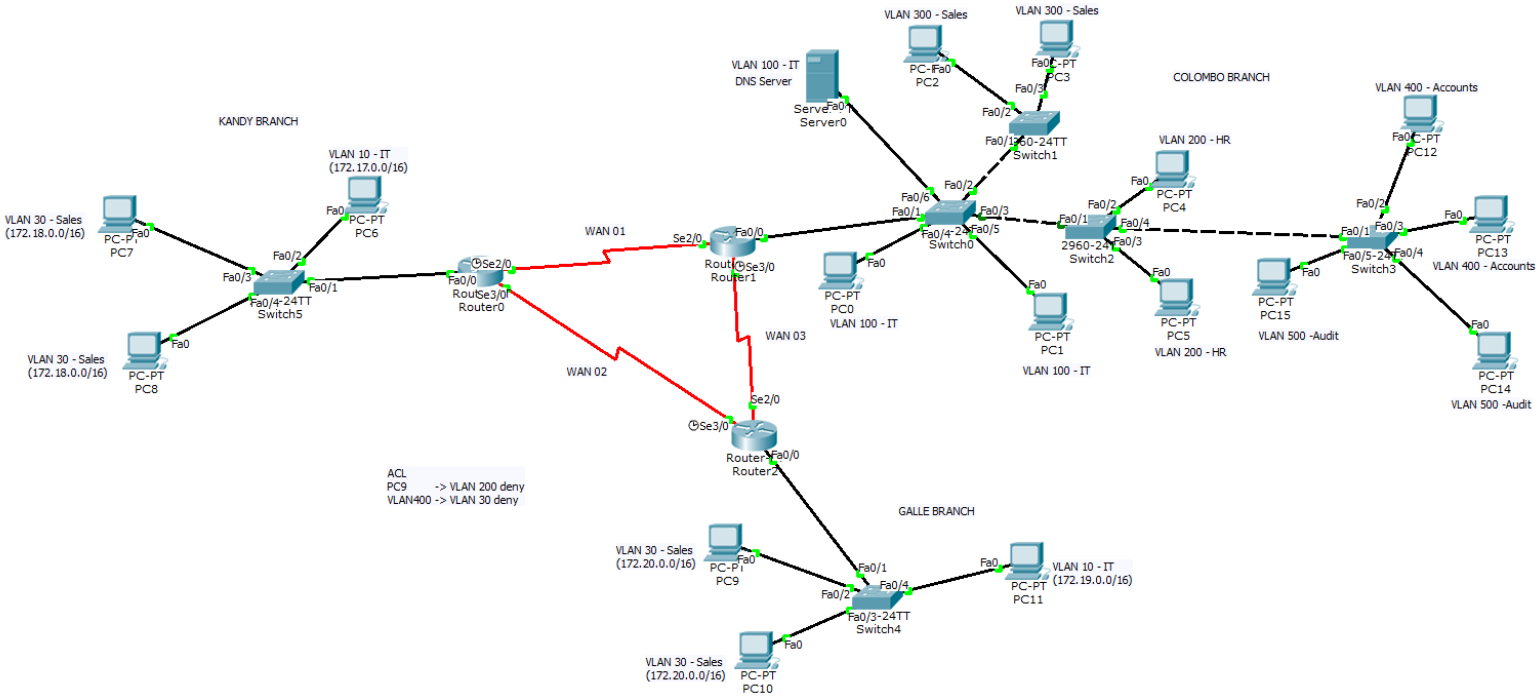
1. Five VLANs for Colombo. VLAN 100, VLAN 200, VLAN 300, VLAN 400 and VLAN 500 has assigned to IT, HR, Sales, Accounts and Audit departments respectively.
2. Two VLANs for Kandy. VLAN 10, VLAN 30 has assigned to IT and Sales respectively.
3. Two VLANs for Galle. VLAN 10, VLAN 30 has assigned to IT and Sales respectively.

You have given the following network addresses

1. Class B private network addresses of 172.16.0.0 for the Colombo branch.
2. Class B private network addresses of 172.17.0.0 for IT department of the Kandy branch.
3. Class B private network addresses of 172.18.0.0 for the Sales department of the Kandy branch.
4. Class B private network addresses of 172.19.0.0 for IT department of the Galle branch.
5. Class B private network addresses of 172.20.0.0 for the Sales department of the Galle branch.
6. Your ISP granted classless public network addresses of 204.50.30.16/28 for Wide area networks (WAN 01, WAN 02 and WAN 03).

The following diagram illustrates the network for your company.

Note: Colombo branch (172.16.0.0) and the Wide area networks (204.50.30.16/28) should be sub-netted as per the diagram.




*If this network diagram is not clear, a larger view of this network diagram also available in the Moodle quiz in a separate link*

Take the **Generic Router-PT** and **2960 switches**.
Note: device types, interface port numbers and device labels should be the same as mentioned in the diagram

Hint: Before starting the configuration, read the entire parts of the paper below.

Note: You are required **to use** the Subnet Zero and All-Ones subnet.

## Part 01 – Colombo branch configuration

You are required to create 05 subnets for Colombo branch, and your subnets should fulfil the following requirements.

1. Subnet 01 (VLAN 100 - IT department) should support at least 20,000 hosts.
2. Subnet 02 (VLAN 200 - HR department) should support at least 15,000 hosts.
3. Subnet 03 (VLAN 300 - Sales department) should support at least 7,000 hosts.
4. Subnet 04 (VLAN 400 - Accounts department) should support at least 4,000 hosts.
5. Subnet 05 (VLAN 500 - Audit department) should support at least 4,000 hosts.

Find how many minimum numbers of Host bits taken into the Network bits for this purpose and find the subnet mask for each subnet using variable-length subnet masking (VLSM).

Configure the DHCP IP address plan for the above VLANs in Router1 as mentioned below.

1. Create five DHCP Server pools in Router1 for VLANs and enable the DHCP on PCs.

   Set the following DHCP pool names.

| SUBNET / VLAN | VLAN ID | VLAN NAME | DHCP POOL NAME |
|---|---|---|---|
| Subnet 01 – IT (VLAN 100) | 100 | IT | IT |
| Subnet 02 – HR (VLAN 200) | 200 | HR | HR |
| Subnet 03 – Sales (VLAN 300) | 300 | Sales | Sales |
| Subnet 04 – Accounts (VLAN 400) | 400 | Accounts | Accounts |
| Subnet 05 – Audit (VLAN 500) | 500 | Audit | Audit |

Table 01

   Note: DHCP pool names and VLAN names are case sensitive and should be same as mentioned in the above table.

   - Take the last usable IP address of each subnet as the default gateway.
   - Take the IP address of Server0 (in VLAN 100- IT department) as DNS Server for all VLANs.
   - Take the first usable IP address of subnet 01 (VLAN 100) to the Server0. Hence exclude the first usable IP address from DHCP pool.
   - Statically set the IP Address, subnet mask and default gateway to the Server0. (Do not enable DHCP in Server0)

2. Create all VLANs and set the VLAN names on all switches.

   Note: use VLAN Trunking Protocol (VTP) server name as **dropLineVTP**

   VLAN IDs and VLAN names should be same as mentioned in the above table (Table 01).

3. Configure all switch ports, as mentioned in the network diagram.
4. Create 05 sub-interfaces in fastEthernet 0/0 of Router1 and assign VLANs, respectively.

   (1st sub-interface to VLAN 100, 2nd sub-interface to VLAN 200, 3rd sub-interface to VLAN 300, 4th sub-interface to VLAN 400 and 5th sub-interface to VLAN 500)

## Part 02 – Kandy branch configuration

1. Create two VLANs as per the following table (Table 02)

| SUBNET / VLAN | VLAN ID | VLAN NAME | NETWORK ADDRESS |
|---|---|---|---|
| Subnet 01 – IT (VLAN 10) | 10 | IT | 172.17.0.0/16 |
| Subnet 02 – Sales (VLAN 30) | 30 | Sales | 172.18.0.0/16 |

Table 02

2. Configure all switch ports, as mentioned in the network diagram.
3. Create 02 sub-interfaces in fastEthernet 0/0 of Router0 and assign VLANs, respectively.
   (1st sub-interface to VLAN 10 and 2nd sub-interface to VLAN 30)
   - Take the last usable IP address of each subnet as the default gateway
   - Use 1st usable IP address of VLAN 10 to PC6
   - Use 1st and 2nd usable IP addresses of VLAN 30 to PC7 and PC8 respectively.
   - Statically set the IP Address, subnet mask and default gateway to PC6, PC7 and PC8.

## Part 03 – Galle branch configuration

1. Create two VLANs as per the following table (Table 03)

| SUBNET / VLAN | VLAN ID | VLAN NAME | NETWORK ADDRESS |
|---|---|---|---|
| Subnet 01 – IT (VLAN 10) | 10 | IT | 172.19.0.0/16 |
| Subnet 02 – Sales (VLAN 30) | 30 | Sales | 172.20.0.0/16 |

Table 03

2. Configure all switch ports, as mentioned in the network diagram.
3. Create 02 sub-interfaces in fastEthernet 0/0 of Router2 and assign VLANs, respectively.
   (1st sub-interface to VLAN 10 and 2nd sub-interface to VLAN 30)
   - Take the last usable IP address of each subnet as the default gateway
   - Use 1st usable IP address of VLAN 10 to PC11
   - Use 1st and 2nd usable IP addresses of VLAN 30 to PC9 and PC10 respectively.
   - Statically set the IP Address, subnet mask and default gateway to PC11, PC9 and PC10.

## Part 04 – Wide Area Network (WAN) configuration

As per the ISP given network address of 204.50.30.16/28, you are required to create 03 subnets for Wide area networks (WAN 01, WAN 02 and WAN 03).

Find how many minimum numbers of Host bits taken into the Network bits for this purpose and find the subnet mask.

Use 1st subnet for WAN 01, 2nd subnet for WAN 02 and 3rd subnet for WAN 03.

1. Take the 1st usable IP address of WAN 01 to Serial 2/0 of Router1 (Colombo router).
2. Take the 2nd usable IP address of WAN 01 to Serial 2/0 of Router0 (Kandy router).
3. Take the 1st usable IP address of WAN 02 to Serial 3/0 of Router0 (Kandy router).
4. Take the 2nd usable IP address of WAN 02 to Serial 3/0 of Router2 (Galle router).
5. Take the 1st usable IP address of WAN 03 to Serial 3/0 of Router1 (Colombo router).
6. Take the 2nd usable IP address of WAN 03 to Serial 2/0 of Router2 (Galle router).
7. Set the clock rate as 64000 for necessary router interfaces.
8. Set **dynamic** routing **RIP** in all the routers.
9. After configuring all the routers and switches, check the connectivity.

## Part 05 – Access Control List

Create **standard** access control list for the following.

1. PC9 of Galle branch not allowed to access VLAN 200 (HR) of Colombo branch and any other network traffic should be permitted.

   Note: use the access-list number as 50 (No marks given for **unnecessary** ACL lines.)
2. VLAN 400 (Accounts) of the Colombo branch not allowed to access VLAN 30 (Sales) of the Kandy branch and any other network traffic should be permitted.

   Note: use the access-list number as 60 (No marks given for **unnecessary** ACL lines.)

   Apply the access lists to the **most appropriate** sub interface(s) direction in necessary routers.
3. Check the connectivity again.

-------End of question paper-------