

CIS: IT INFRASTRUCTURE MANAGAMENT PROJECT

Group Name

Abstract

The objective of the current work is to design, configure, and verify two routing protocols i.e. OSPF and RIP for a cyber-security Company. The first one is the link state routing protocol and the second is the distance vector routing protocol. We have taken a sample topology for the configuration of these protocols in the Cisco Packet Tracer. We have also configured different VLAN in the sample topology in order to segregate the traffic of one department from the other. We have also established one separate place for installation of different servers which are used to provide different services in the network.

There is a second part of the project which relates to the Cloud Computing. It highlights different cloud model, services offered by the cloud provider, and also some of the key advantages offered by the cloud computing. This part familiarize the state of the art technology cloud computing and its different advantages in the field of computer networks.

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NETWORK DESIGN AND CONFIGURATION PART

Introduction

A network is a combination of two or more network devices in order to share the network resources. Since network resources are scarce so these resources are shared on a common network where the other users can access these resources for use. It saves the cost for company which is the major concern in many different companies. In the current, we have to design a detailed network design for a cyber-security company which fulfils the following conditions:-

- We have to run two protocols i.e. OSPF and RIP routing protocols
- There are more than one departments and we have to show inter-operability between the departments
- Traffic in between these departments is segregated by using the concept of VLANs
- We have also implemented different servers in order to provide different services in the network
- Routes are shared between different domains using the concept of route redistribution
- After implementing all these we have to show connectivity between these departments to verify that network is working properly

Network Topology

The following drawings illustrate the network logical topology. The detail of the logical diagram is as follows:-

- We have implemented four different departments i.e. Sale, Finance, Marketing, and HQ. All these department are kept in separate Vlan's for the ease of management
- There is also a server as shown in the topology diagram that is kept in a separate VLAN
- All the departments have a separate router which is used as a default gateway for each department
- OSPF will run between R1 & R2 whereas RIP will run between R1 & R3. R1 Also have an Internet Connection
- We have also implemented a Wireless Lan Controller for the ease of management of wireless Access Points

- We have used DHCP and DNS servers. The DHCP server will provide dynamic IP addresses and DNS will resolve host to IP address

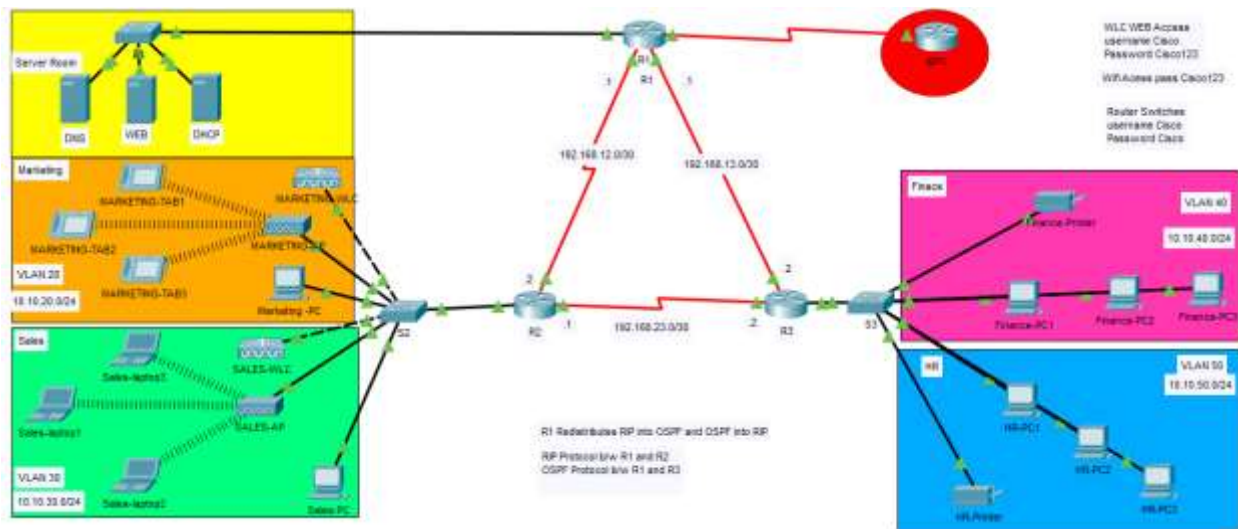


Figure1: Network Topology for Cyber Security Ltd

Network Table

The Network topology has three routers i.e. R1, R2 and R3. The VLANs corresponding subnets and departments connected with R1, R2 and R3 are given in table below.

Sr. No	Department Name	VLAN	Network/Mask	Gateway
1	Servers	10	10.10.10.0/24	10.10.10.254
2	Marketing	20	10.10.20.0/24	10.10.20.254
3	Sales	30	10.10.30.0/24	10.10.30.254
4	Finance	40	10.10.40.0/24	10.10.40.254
5	HR	50	10.10.50.0/24	10.10.50.254

There are 03 types of server installed in server room the details of servers are given as follows.

Sr. No	Server Role	IP /Mask	Gateway
1	DNS server	10.10.10.1/24	10.10.10.254
2	WEB server	10.10.10.2/24	10.10.10.254
3	DHCP server	10.10.10.3/24	10.10.10.254

End user IP address Table Marketing Department

Sr. No	Department/Device	IP / Mask	Gateway
1	MARKETING-TAB1	10.10.20.X	10.10.20.254
2	MARKETING-TAB1	10.10.20.X	10.10.20.254
3	MARKETING-TAB1	10.10.20.X	10.10.20.254
4	MARKETING-WLC	10.10.20.1	10.10.20.254
5	MARKETING-PC	10.10.20.X	10.10.20.254
6	MARKETING-AP	10.10.20.X	10.10.20.254

End user IP address Table Sales Department

Sr. No	Department/Device	IP / Mask	Gateway
1	SALES-LAPTOP1	10.10.30.X	10.10.30.254
2	SALES-LAPTOP2	10.10.30.X	10.10.30.254
3	SALES-LAPTOP3	10.10.30.X	10.10.30.254
4	SALES-WLC	10.10.30.1	10.10.30.254
5	SALES-PC	10.10.30.X	10.10.30.254

6	SALES-AP	10.10.30.X	10.10.30.254
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End user IP address Table Finance Department

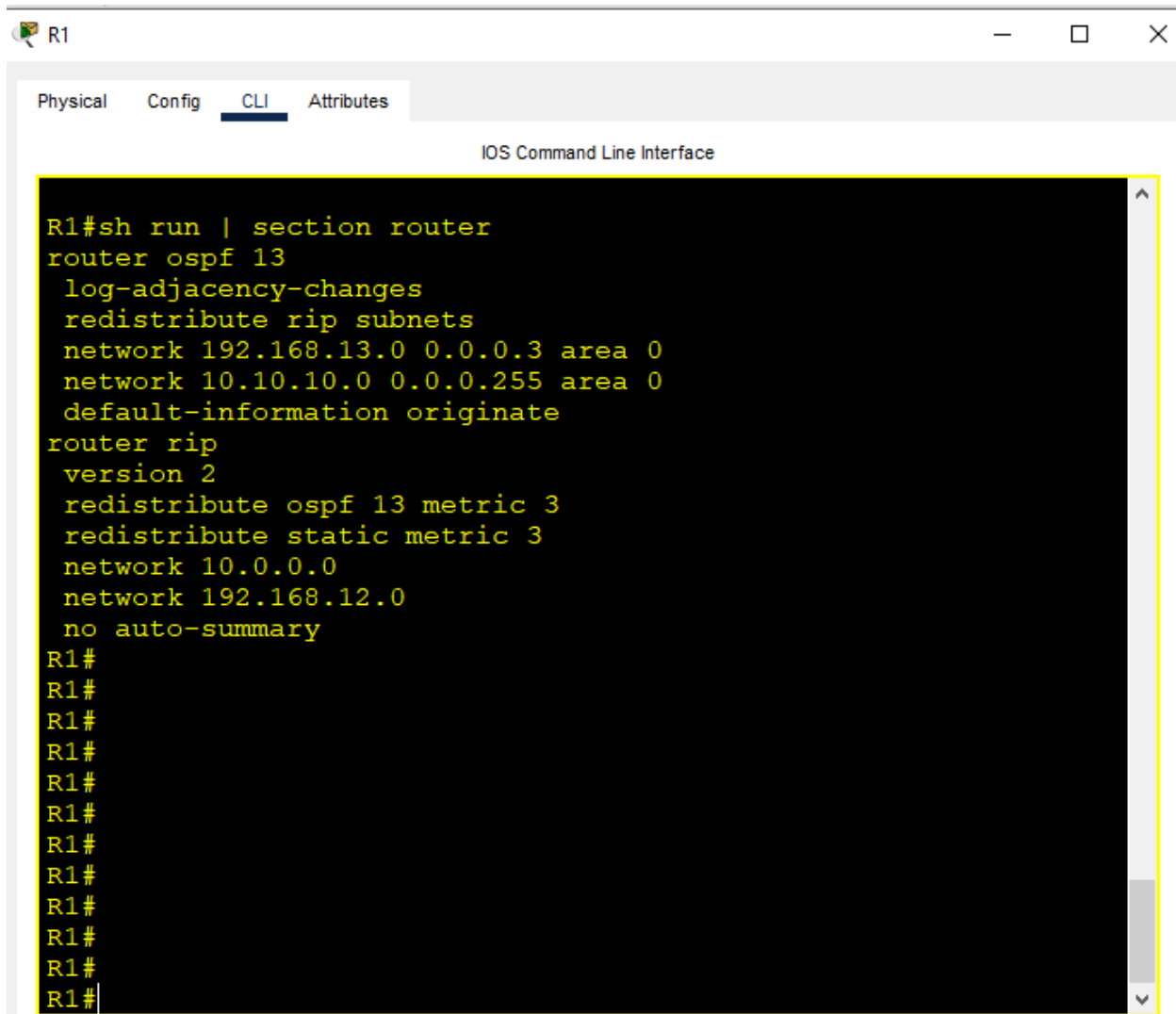
Sr. No	Department/Device	IP / Mask	Gateway
1	FINANCE-PC1	10.10.40.X	10.10.40.254
2	FINANCE-PC2	10.10.40.X	10.10.40.254
3	FINANCE-PC3	10.10.40.X	10.10.40.254
4	FINANCE-PRINTER	10.10.40.X	10.10.40.254

End user IP address Table HR Department

Sr. No	Department/Device	IP / Mask	Gateway
1	HR-PC1	10.10.50.X	10.10.50.254
2	HR-PC1	10.10.50.X	10.10.50.254
3	HR-PC1	10.10.50.X	10.10.50.254
4	HR-PRINTER	10.10.50.X	10.10.50.254

Routing Protocols RIP and OSPF

RIP protocol is running between R1 and R2. The router R1 and R3 are running OSPF to share routes. The configuration on R1 is shown below.



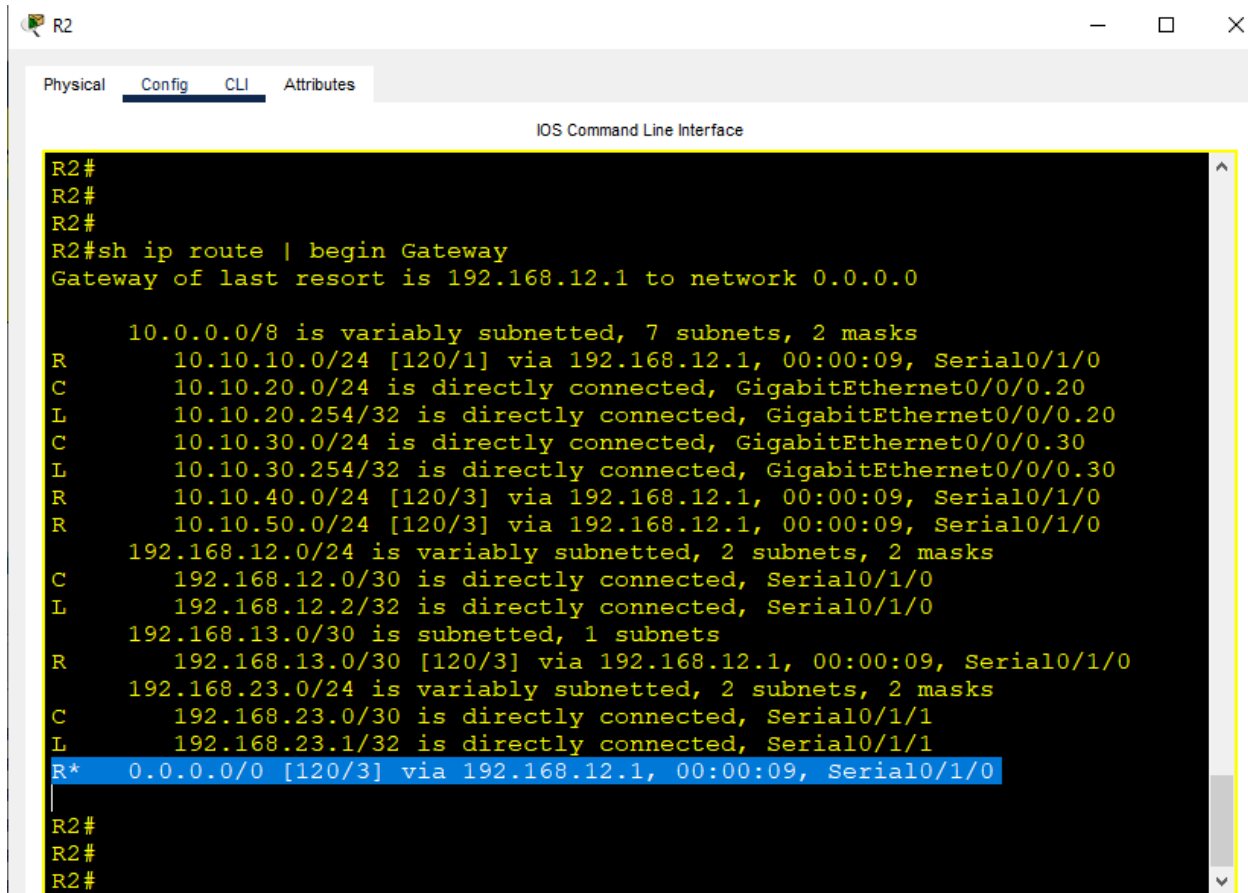
The screenshot shows a window titled 'R1' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The terminal output shows the following configuration commands:

```
R1#sh run | section router
router ospf 13
  log-adjacency-changes
  redistribute rip subnets
  network 192.168.13.0 0.0.0.3 area 0
  network 10.10.10.0 0.0.0.255 area 0
  default-information originate
router rip
  version 2
  redistribute ospf 13 metric 3
  redistribute static metric 3
  network 10.0.0.0
  network 192.168.12.0
  no auto-summary
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

Figure2: R1 Routing Protocols configurations

R2 Routing Table

The router R2 has only RIP protocol R1 redistributes OSPF and static routes into RIP, routing table of R2 is shown as below.



The screenshot shows a Cisco IOS Command Line Interface for router R2. The user has entered the command 'sh ip route | begin Gateway', which displays the gateway of last resort and a list of routes. The routes are categorized by their type (R for RIB, C for Connected, L for Local) and their source (10.0.0.0/8, 192.168.12.0/24, 192.168.13.0/30, 192.168.23.0/24). The gateway of last resort is 192.168.12.1 to network 0.0.0.0. The route 0.0.0.0/0 [120/3] via 192.168.12.1, 00:00:09, Serial0/1/0 is highlighted in blue.

```

R2#
R2#
R2#
R2#sh ip route | begin Gateway
Gateway of last resort is 192.168.12.1 to network 0.0.0.0

  10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
R    10.10.10.0/24 [120/1] via 192.168.12.1, 00:00:09, Serial0/1/0
C    10.10.20.0/24 is directly connected, GigabitEthernet0/0/0.20
L    10.10.20.254/32 is directly connected, GigabitEthernet0/0/0.20
C    10.10.30.0/24 is directly connected, GigabitEthernet0/0/0.30
L    10.10.30.254/32 is directly connected, GigabitEthernet0/0/0.30
R    10.10.40.0/24 [120/3] via 192.168.12.1, 00:00:09, Serial0/1/0
R    10.10.50.0/24 [120/3] via 192.168.12.1, 00:00:09, Serial0/1/0
  192.168.12.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.12.0/30 is directly connected, Serial0/1/0
L    192.168.12.2/32 is directly connected, Serial0/1/0
  192.168.13.0/30 is subnetted, 1 subnets
R    192.168.13.0/30 [120/3] via 192.168.12.1, 00:00:09, Serial0/1/0
  192.168.23.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.23.0/30 is directly connected, Serial0/1/1
L    192.168.23.1/32 is directly connected, Serial0/1/1
R*  0.0.0.0/0 [120/3] via 192.168.12.1, 00:00:09, Serial0/1/0
R2#
R2#
R2#

```

Figure3: R2 Routing Table

R3 Routing Table

The router R3 has only OSPF protocol R1 redistributes RIP and static routes into OSPF, routing table of R3 is shown as below.

```

R3#
R3#
R3#
R3#
R3#
R3#sh ip route | begin Gateway
Gateway of last resort is 192.168.13.1 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O      10.10.10.0/24 [110/65] via 192.168.13.1, 00:32:50, Serial0/1/1
O E2    10.10.20.0/24 [110/20] via 192.168.13.1, 00:32:50, Serial0/1/1
O E2    10.10.30.0/24 [110/20] via 192.168.13.1, 00:32:50, Serial0/1/1
C      10.10.40.0/24 is directly connected, GigabitEthernet0/0/0.40
L      10.10.40.254/32 is directly connected, GigabitEthernet0/0/0.40
C      10.10.50.0/24 is directly connected, GigabitEthernet0/0/0.50
L      10.10.50.254/32 is directly connected, GigabitEthernet0/0/0.50
    192.168.12.0/30 is subnetted, 1 subnets
O E2    192.168.12.0/30 [110/20] via 192.168.13.1, 00:32:50, Serial0/1/1
    192.168.13.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.13.0/30 is directly connected, Serial0/1/1
L      192.168.13.2/32 is directly connected, Serial0/1/1
    192.168.23.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.23.0/30 is directly connected, Serial0/1/0
L      192.168.23.2/32 is directly connected, Serial0/1/0
O*E2 0.0.0.0/0 [110/1] via 192.168.13.1, 00:05:39, Serial0/1/1
R3#

```

Figure4: R3 Routing Table

DHCP Server

DHCP server is used to allocate IP address to end users in each department the DHCP server is placed in server room the DHCP server configuration is shown as below.

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: HR

Default Gateway: 10.10.50.254

DNS Server: 10.10.10.1

Start IP Address: 10 10 50 10

Subnet Mask: 255 255 255 0

Maximum Number of Users: 100

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Add Save Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
HR	10.10.50.254	10.10.10.1	10.10.50.10	255.255.255.0	100	0.0.0.0	0.0.0.0
serverPool	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	0	0.0.0.0	0.0.0.0
Finance	10.10.40.254	10.10.10.1	10.10.40.10	255.255.255.0	100	0.0.0.0	0.0.0.0
sales	10.10.30.254	10.10.10.1	10.10.30.10	255.255.255.0	100	0.0.0.0	10.10.30.1
Marketing	10.10.20.254	10.10.10.1	10.10.20.10	255.255.255.0	100	0.0.0.0	10.10.20.1

Figure5: DHCP Pools

The Client are getting IP setting from DHCP server the client obtain IP setting is shown as below.

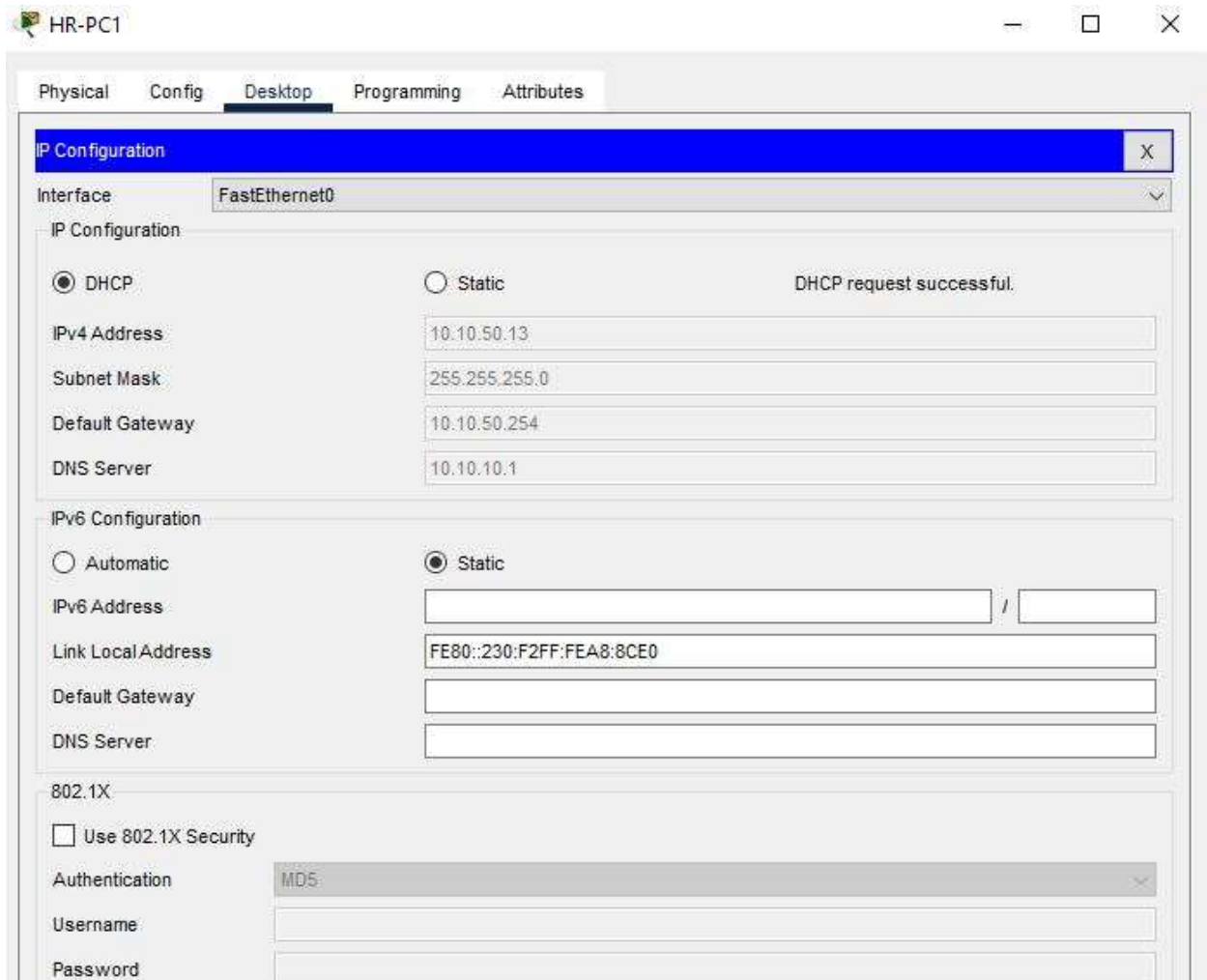


Figure6: DHCP Client

VLAN Configuration

VLANs are configured at R1, R2 and R3 LAN sites. The VLAN configurations for R1 LAN Switch S2 is shown as below.

```

to up

User Access Verification
Username:
Username: Cisco
Password:

S2>
S2>en
S2#sh vlan br

VLAN  Name                               Status  Ports
-----
1     default                               active  Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                           Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                           Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                           Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                           Fa0/23, Fa0/24, Gig0/2
20    Marketing                           active  Fa0/1, Fa0/2, Fa0/6
30    Sales                               active  Fa0/3, Fa0/4, Fa0/5
1002  fddi-default                           active
1003  token-ring-default                     active
1004  fddinet-default                       active
1005  trnet-default                         active
S2#

```

Figure7: VLAN on S2

Wireless LAN Controller

WLC is used to control Access Points, there is one WLC and one Access point installed in Marketing and Sales department each attached to R2 LAN network. The WLC is accessed via web page as shown below.



Figure8: WLC HTTPS access

The Access point are registered in WLC as shown below.

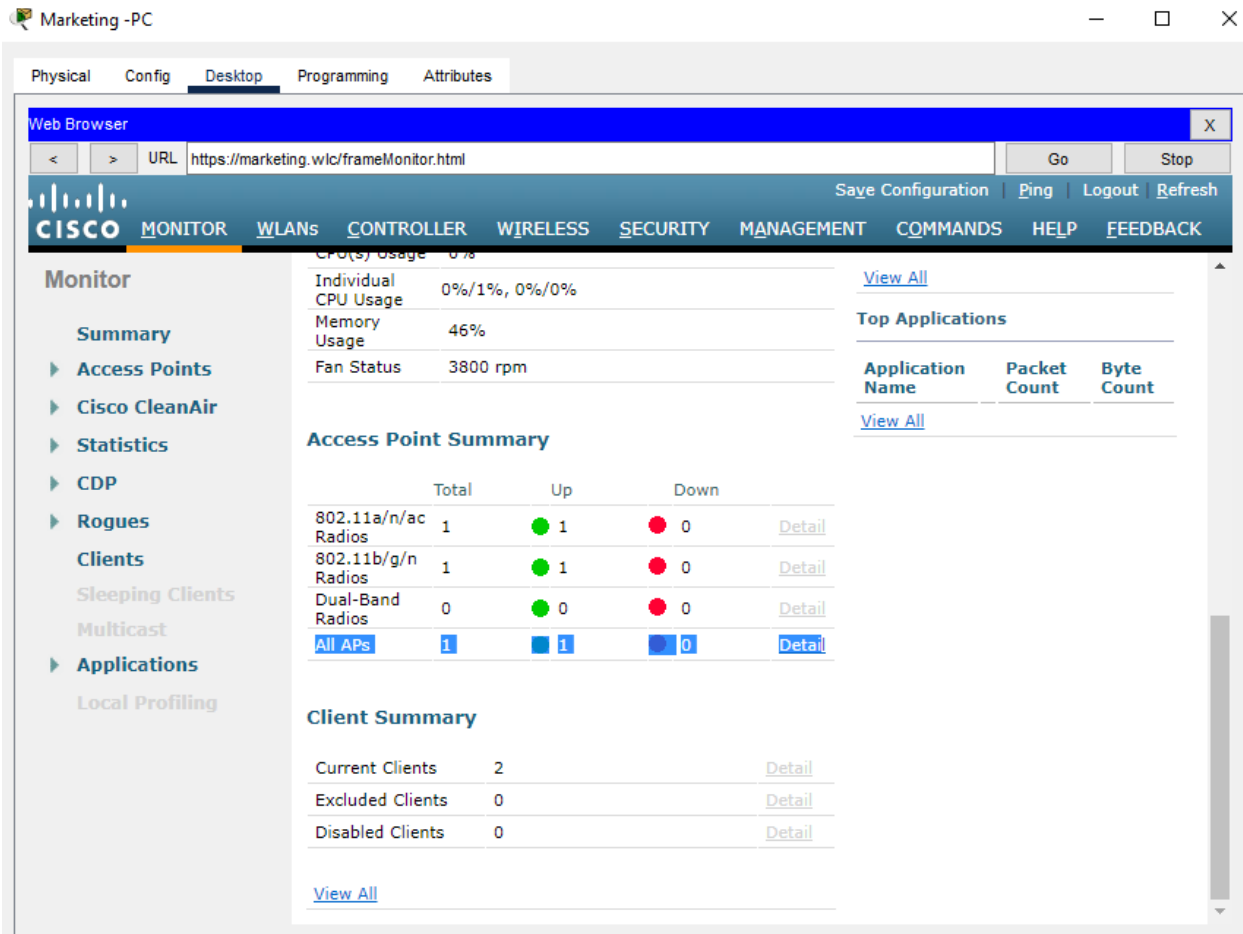


Figure9: Access Point Registered With WLC

Wireless Users Connecting to Network Via Access Point

The wireless users connect to the network via Access point the setting on Security and SSID setting on Access point is given as below.

The screenshot shows the 'MARKETING-TAB2' configuration window with the 'Config' tab selected. The left sidebar shows a tree view with 'GLOBAL' (Settings, Algorithm Settings) and 'INTERFACE' (Wireless0, 3G/4G Cell1, Bluetooth). The 'Wireless0' interface is selected, showing the following settings:

- Port Status:** ☒ On
- Bandwidth:** 300 Mbps
- MAC Address:** 00E0.B069.DABD
- SSID:** MARKETING-WIFI
- Authentication:**
 - ☐ Disabled
 - ☐ WPA-PSK
 - ☐ WPA
 - ☐ 802.1X
 - ☒ WPA2-PSK
 - ☐ WPA2
- WEP Key:** [Empty field]
- PSK Pass Phrase:** Cisco123
- User ID:** [Empty field]
- Password:** [Empty field]
- Method:** MD5
- User Name:** [Empty field]
- Password:** [Empty field]
- Encryption Type:** AES
- IP Configuration:**
 - ☒ DHCP
 - ☐ Static
- IPv4 Address:** 10.10.20.13
- Subnet Mask:** 255.255.255.0
- IPv6 Configuration:**
 - ☐ Automatic
 - ☒ Static
- IPv6 Address:** [Empty field]
- Link Local Address:** FE80::2E0:B0FF:FE69:DABD

Figure10: Access Point Settings

WEB Server

The web server is hosted in server room the end users can access the web server via

<https://cybersecurity.com> or <http://cybersecurity.com>

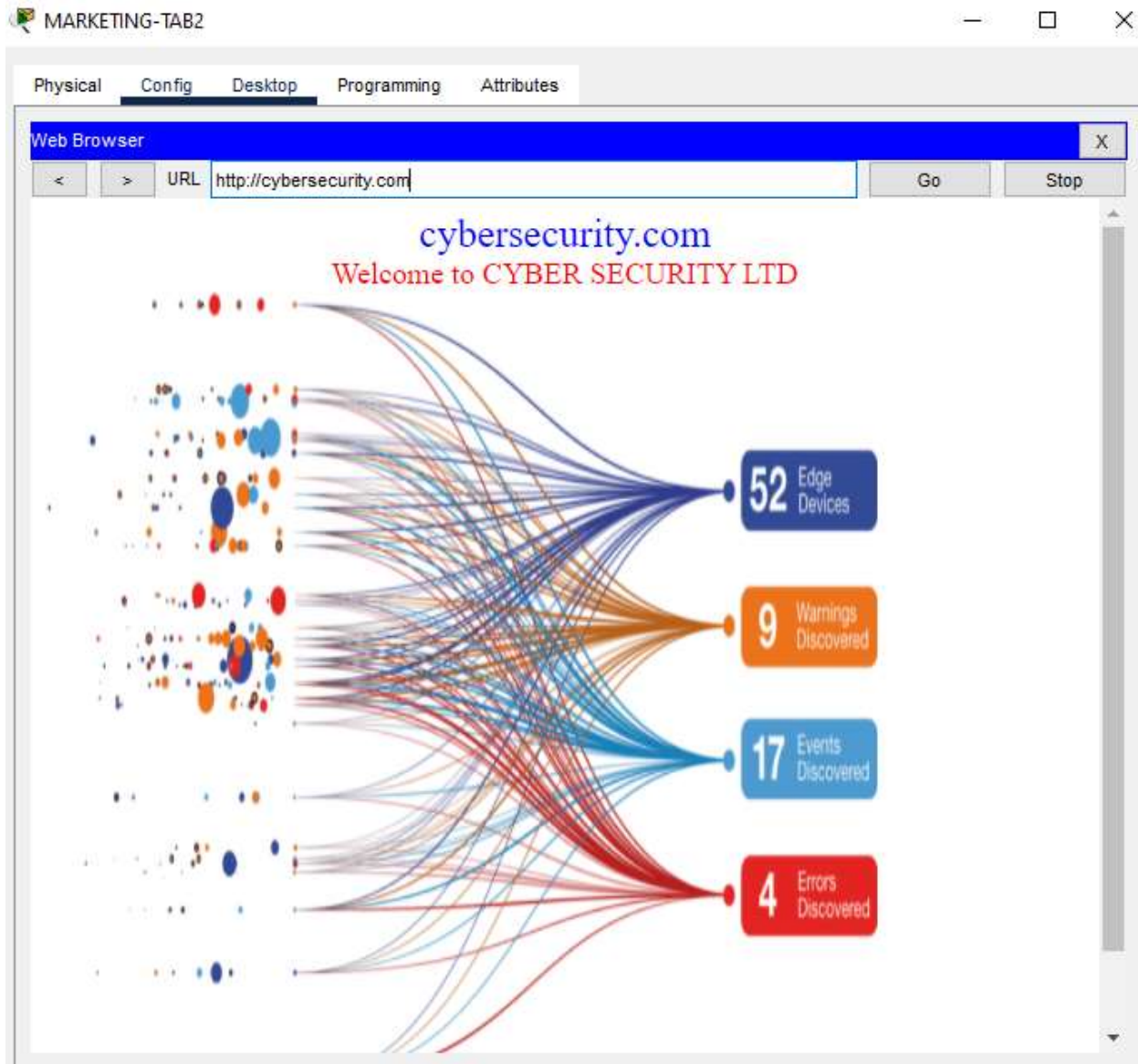


Figure11: End user accessing Web server

End to End Connectivity Tests

The devices in each department can reach other department and ISP the following shows the various ping tests.

















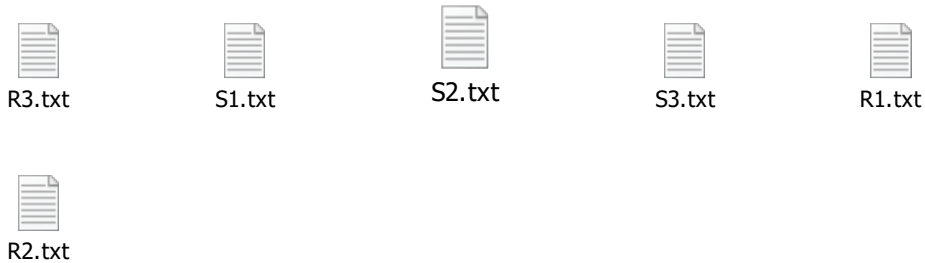
PDU List Window										
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	MARKETING-TAB2	DNS	ICMP		0.000	N	0	(edit)	
	Successful	Sales-laptop3	WEB	ICMP		0.000	N	1	(edit)	
	Successful	Finance-PC3	DHCP	ICMP		0.000	N	2	(edit)	
	Successful	HR-PC1	WEB	ICMP		0.000	N	3	(edit)	
	Successful	MARKETING-TAB1	Finance-PC1	ICMP		0.000	N	4	(edit)	
	Successful	Sales-laptop3	HR-PC1	ICMP		0.000	N	5	(edit)	
	Successful	Sales-laptop3	ISP1	ICMP		0.000	N	6	(edit)	
	Successful	Finance-PC3	ISP1	ICMP		0.000	N	7	(edit)	

Figure12: End to End Ping Tests

Device Configurations

The devices configurations are given as follows.



GRID AND CLOUD COMPUTING PART

CYBER SECURITY LIMITED REQUIRES TO BE COST EFFECTIVE BY MIGRATING TO VMWARE CLOUD SERVICES

Cyber Security Limited has recently deployed a local area network for many departments. Now the company wants to move its physical hardware into a virtualized environment where more network resources may be added with more efficient and cost effective manner. In order to fulfil this need, Company had decided to use the service of VMware Cloud Providers. VMware cloud service provider which is based upon the concept of Virtualization. It provides the abstract services to the customer which are easy to manage and scalable.

SELECTION OF RIGHT SOLUTION PARTNER

In the recent years there is a significant increase in the number of employees of the company which has also increased the size of the departments. As the size of the departments increases, company also needs new network hardware resources like Computers, Switches, Router and other networking devices. This increase in the network devices also increase the cost and management issues for the company. Due to these reason company has decided to move its network resources into to virtualized environment which are more scalable and cost effective.

VMware Cloud Provider works on the concept of virtualized environment wherein the hardware provides an abstraction to the upper layer which obtain the services from these lower layers. VMware cloud services provide a wide range of applications which enable to integrate, manage, and secure cloud based applications. These services are helps you to make management of cloud in a centralized and efficient manner. Currently following are the cloud services which are available:-

- VMware Cloud on AWS
- Cloud Provider Metering
- vRealize Network Insight Cloud
- vRealize Log Insight
- vRealize Automation

CATALYST FOR CHANGE

Cyber Security limited has decided to take the following cloud services from the VMware cloud provider:-

- Use of virtual disk spaces rather than actual hardware for the companies employees
- Virtual Server for the provision of different services in the company
- Use of Soft Phone rather than IP phones to reduce cost

EASE OF MANAGEMENT, COST SAVING, AND COMPETITIVE ADVANTAGE

VMware cloud services offer greater flexibility than the other cloud service providers because it may be used with both public and private cloud. It works on the basis of a single operational model

which increases the ROI and reduces the operational management cost. There is no need to restructure the architecture just like in some of the other platforms SAP, or HashiCorp. We only have to integrate these services and no need to convert the data. It enables the VMware cloud providers to work in an agile, robust, and efficient manner as compared with other cloud providers.

Conclusion

The current project simulates the configuration of OSPF and RIP routing Protocol in the Cisco Packet Tracer for cyber-security Company. We have also implemented different servers for provision of services. Different departments were segregated by configuration of VLANs. In the second part we have highlighted cloud computing which provides an auspicious way for complex computational resources and data storage. Infrastructures for clouds are next generation platforms that can provide tremendous value to companies of any size. It provides software, platform, infrastructure, data storage, and test environments as a service.

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