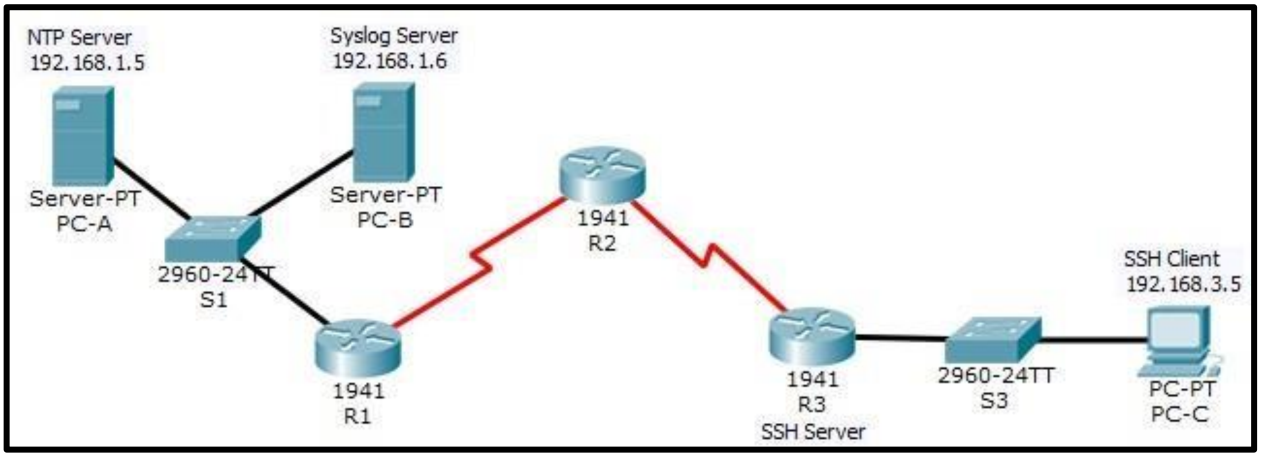
Practical 1: Packet Tracer - Configure Cisco Routers for Syslog, NTP, and SSH Operations

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway	Switch Port
R1	G0/1	192.168.1.1	255.255.255.0	N/A	S1 F0/5
	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A	N/A
R2	S0/0/0	10.1.1.2	255.255.255.252	N/A	N/A
	S0/0/1 (DCE)	10.2.2.2	255.255.255.252	N/A	N/A
R3	G0/1	192.168.3.1	255.255.255.0	N/A	S3 F0/5
	S0/0/1	10.2.2.1	255.255.255.252	N/A	N/A
PC-A	NIC	192.168.1.5	255.255.255.0	192.168.1.1	S1 F0/6
PC-B	NIC	192.168.1.6	255.255.255.0	192.168.1.1	S2 F0/18
PC-C	NIC	192.168.3.5	255.255.255.0	192.168.3.1	S3 F0/18

Objectives

- Configure OSPF MD5 authentication.
- Configure NTP.
- Configure routers to log messages to the syslog server.
- Configure R3 to support SSH connections.

Background / Scenario

In this activity, you will configure OSPF MD5 authentication for secure routing updates.

The NTP Server is the master NTP server in this activity. You will configure authentication on the NTP server and the routers. You will configure the routers to allow the software clock to be synchronized by NTP to the time server. Also, you will configure the routers to periodically update the hardware clock with the time learned from NTP.

The Syslog Server will provide message logging in this activity. You will configure the routers to identify the remote host (Syslog server) that will receive logging messages.

You will need to configure timestamp service for logging on the routers. Displaying the correct time and date in Syslog messages is vital when using Syslog to monitor a network.

You will configure R3 to be managed securely using SSH instead of Telnet. The servers have been preconfigured for NTP and Syslog services respectively. NTP will not require authentication. The routers have been pre-configured with the following passwords:

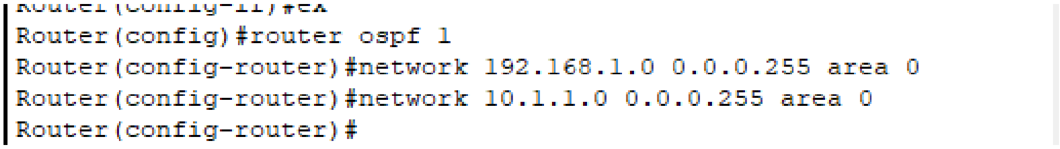
- Enable password: **ciscoenpa55**
- Password for vty lines: **ciscovtypa55**

Note: Note: MD5 is the strongest encryption supported in the version of Packet Tracer used to develop this activity (v6.2). Although MD5 has known vulnerabilities, you should use the encryption that meets the security requirements of your organization. In this activity, the security requirement specifies MD5.

Part 1: Configure OSPF MD5 Authentication

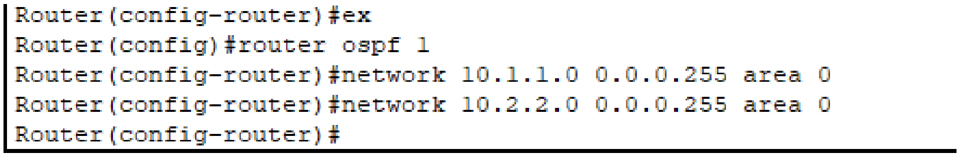
Do OSPF Configuration in all three routers as shown in below images

For R1:



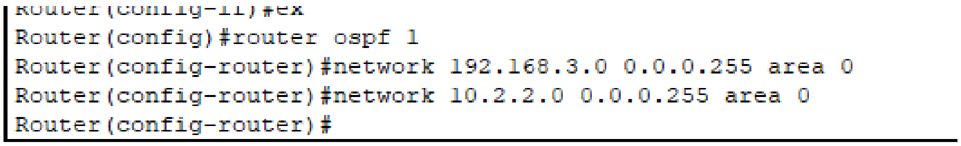
```
Router(config-if)#ex
Router(config)#router ospf 1
Router(config-router)#network 192.168.1.0 0.0.0.255 area 0
Router(config-router)#network 10.1.1.0 0.0.0.255 area 0
Router(config-router)#
```

For R2:



```
Router(config-router)#ex
Router(config)#router ospf 1
Router(config-router)#network 10.1.1.0 0.0.0.255 area 0
Router(config-router)#network 10.2.2.0 0.0.0.255 area 0
Router(config-router)#
```

For R3:



```
Router(config-if)#ex
Router(config)#router ospf 1
Router(config-router)#network 192.168.3.0 0.0.0.255 area 0
Router(config-router)#network 10.2.2.0 0.0.0.255 area 0
Router(config-router)#
```

Step 1: Test connectivity. All devices should be able to ping all other IP addresses.

Step 2: Configure OSPF MD5 authentication for all the routers in area 0. Configure

OSPF MD5 authentication for all the routers in area 0.

```
R1(config)# router ospf 1
R1(config-router)# area 0 authentication message-digest
R2(config)# router ospf 1
R2(config-router)# area 0 authentication message-digest

R3(config)# router ospf 1
R3(config-router)# area 0 authentication message-digest
```

Step 3: Configure the MD5 key for all the routers in area 0. Configure an MD5 key on the serial

interfaces on **R1**, **R2** and **R3**. Use the password **MD5pa55** for key **1**.

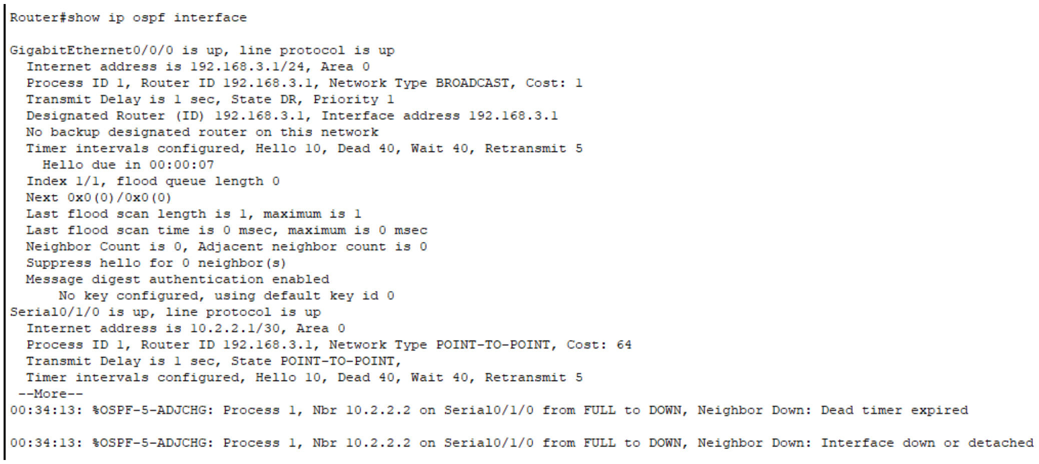
```
R1(config)# interface s0/0/0
R1(config-if)# ip ospf message-digest-key 1 md5 MD5pa55

R2(config)# interface s0/0/0
R2(config-if)# ip ospf message-digest-key 1 md5 MD5pa55
R2(config-if)# interface s0/0/1
R2(config-if)# ip ospf message-digest-key 1 md5 MD5pa55

R3(config)# interface s0/0/1
R3(config-if)# ip ospf message-digest-key 1 md5 MD5pa55
```

Step 4: Verify configurations.

a. Verify the MD5 authentication configurations using the commands **show ip ospf interface**.



```
Router#show ip ospf interface

GigabitEthernet0/0/0 is up, line protocol is up
  Internet address is 192.168.3.1/24, Area 0
  Process ID 1, Router ID 192.168.3.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 192.168.3.1, Interface address 192.168.3.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
  Message digest authentication enabled
      No key configured, using default key id 0
Serial0/1/0 is up, line protocol is up
  Internet address is 10.2.2.1/30, Area 0
  Process ID 1, Router ID 192.168.3.1, Network Type POINT-TO-POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT-TO-POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
 --More--
00:34:13: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/1/0 from FULL to DOWN, Neighbor Down: Dead timer expired

00:34:13: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/1/0 from FULL to DOWN, Neighbor Down: Interface down or detached
```

For R3

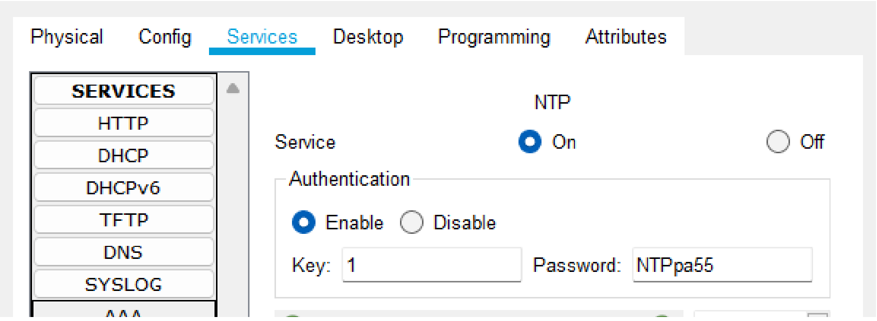
b.Verify end-to-end connectivity.

Part 2: Configure NTP

Step 1: Enable NTP authentication on PC-A.

a. On **PC-A**, click **NTP** under the Services tab to verify NTP service is enabled.

b. To configure NTP authentication, click **Enable** under Authentication. Use key **1** and password **NTPpa55** for authentication.



NTP

Service ● On ○ Off

Authentication

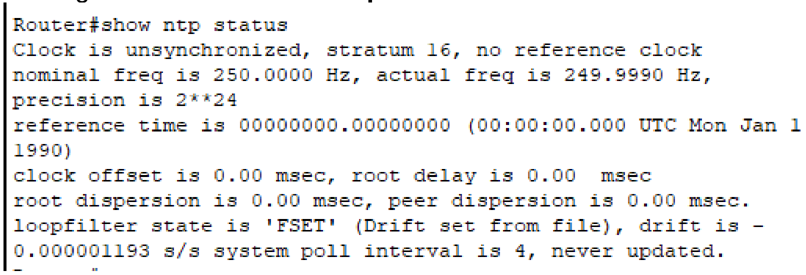
● Enable ○ Disable

Key: 1 Password: NTPpa55

Step 2: Configure R1, R2, and R3 as NTP clients.

```
R1(config)# ntp server 192.168.1.5
R2(config)# ntp server 192.168.1.5
R3(config)# ntp server 192.168.1.5
```

Verify client configuration using the command **show ntp status**.

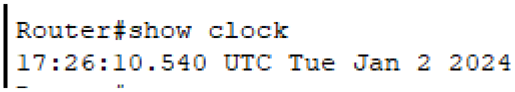


```
Router#show ntp status
Clock is unsynchronized, stratum 16, no reference clock
nominal freq is 250.0000 Hz, actual freq is 249.9990 Hz,
precision is 2**24
reference time is 00000000.00000000 (00:00:00.000 UTC Mon Jan 1
1990)
clock offset is 0.00 msec, root delay is 0.00  msec
root dispersion is 0.00 msec, peer dispersion is 0.00 msec.
loopfilter state is 'FSET' (Drift set from file), drift is -
0.000001193 s/s system poll interval is 4, never updated.
```

Step 3: Configure routers to update hardware clock. Configure **R1**, **R2**, **and R3** to periodically update the hardware clock with the time learned from NTP.

```
R1(config)# ntp update-calendar
R2(config)# ntp update-calendar
R3(config)# ntp update-calendar
```

Exit global configuration and verify that the hardware clock was updated using the command **show clock**.



```
Router#show clock
17:26:10.540 UTC Tue Jan 2 2024
```

Step 4: Configure NTP authentication on the routers. Configure NTP authentication on **R1**, **R2**, and **R3** using key **1** and password **NTPpa55**.

```
R1(config)# ntp authenticate
R1(config)# ntp trusted-key 1
R1(config)# ntp authentication-key 1 md5 NTPpa55

R2(config)# ntp authenticate
R2(config)# ntp trusted-key 1
R2(config)# ntp authentication-key 1 md5 NTPpa55

R3(config)# ntp authenticate
R3(config)# ntp trusted-key 1
R3(config)# ntp authentication-key 1 md5 NTPpa55
```

Step 5: Configure routers to timestamp log messages.

Configure timestamp service for logging on the routers.

```
R1(config)# service timestamps log datetime msec
R2(config)# service timestamps log datetime msec
R3(config)# service timestamps log datetime msec
```

Part 3: Configure Routers to Log Messages to the Syslog Server

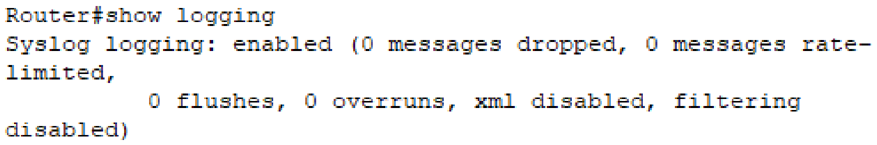
Step 1: Configure the routers to identify the remote host (Syslog Server) that will receive logging messages.

```
R1(config)# logging host 192.168.1.6
R2(config)# logging host 192.168.1.6
R3(config)# logging host 192.168.1.6
```

The router console will display a message that logging has started.

Step 2: Verify logging configuration.

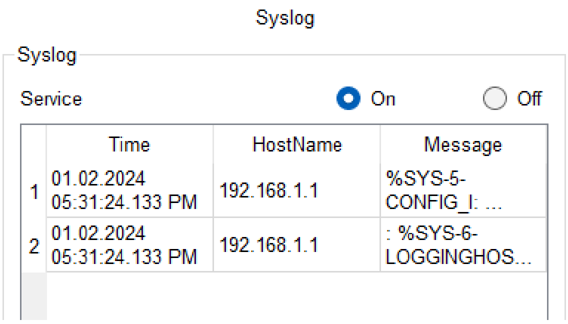
Use the command **show logging** to verify logging has been enabled.



```
Router#show logging
Syslog logging: enabled (0 messages dropped, 0 messages rate-
limited,
          0 flushes, 0 overruns, xml disabled, filtering
disabled)
```

Step 3: Examine logs of the Syslog Server.

From the **Services** tab of the **Syslog Server**'s dialogue box, select the **Syslog** services button. Observe the logging messages received from the routers.



Syslog

Syslog

Service ● On ○ Off

	Time	HostName	Message
1	01.02.2024 05:31:24.133 PM	192.168.1.1	%SYS-5-CONFIG_I: ...
2	01.02.2024 05:31:24.133 PM	192.168.1.1	: %SYS-6-LOGGINGHOS...

Note: Log messages can be generated on the server by executing commands on the router. For example, entering and exiting global configuration mode will generate an informational configuration message. You may need to click a different service and then click **Syslog** again to refresh the message display.

Part 4: Configure R3 to Support SSH Connections

Step 1: Configure a domain name. Configure a

domain name of **ccnasecurity.com** on **R3**.

```
R3(config)# ip domain-name ccnasecurity.com
```

Step 2: Configure users for login to the SSH server on R3.

Create a user ID of **SSHadmin** with the highest possible privilege level and a secret password of **ciscosshpa55**.

```
R3(config)# username SSHadmin privilege 15 secret ciscosshpa55
```

Step 3: Configure the incoming vty lines on R3. Use the local user accounts for

mandatory login and validation. Accept only SSH connections.

```
R3(config)# line vty 0 4
R3(config-line)# login local
R3(config-line)# transport input ssh
```

Step 4: Erase existing key pairs on R3. Any existing

RSA key pairs should be erased on the router.

```
R3(config)# crypto key zeroize rsa
```

Note: If no keys exist, you might receive this message: `% No Signature RSA Keys found in configuration`.

Step 5: Generate the RSA encryption key pair for R3.

The router uses the RSA key pair for authentication and encryption of transmitted SSH data. Configure the RSA keys with a modulus of **1024**. The default is 512, and the range is from 360 to 2048.

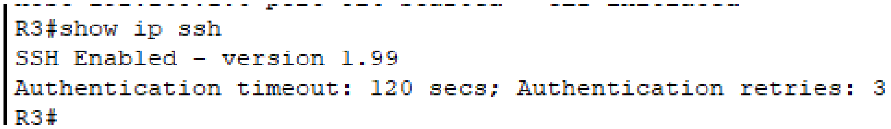
```
R3(config)# crypto key generate rsa
The name for the keys will be: R3.ccnasecurity.com
Choose the size of the key modulus in the range of 360 to 2048 for your
  General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.


How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]
```

Note: The command to generate RSA encryption key pairs for **R3** in Packet Tracer differs from those used in the lab.

Step 6: Verify the SSH configuration.

Use the **show ip ssh** command to see the current settings. Verify that the authentication timeout and retries are at their default values of 120 and 3.



```
R3#show ip ssh
SSH Enabled - version 1.99
Authentication timeout: 120 secs; Authentication retries: 3
R3#
```

Step 7: Configure SSH timeouts and authentication parameters.

The default SSH timeouts and authentication parameters can be altered to be more restrictive. Set the timeout to **90** seconds, the number of authentication retries to **2**, and the version to **2**.

```
R3(config)# ip ssh time-out 90
R3(config)# ip ssh authentication-retries 2
R3(config)# ip ssh version 2
```

Issue the **show ip ssh** command again to confirm that the values have been changed.

Step 8: Attempt to connect to R3 via Telnet from PC-C.

Open the Desktop of **PC-C**. Select the Command Prompt icon. From **PC-C**, enter the command to connect to **R3** via Telnet.

```
PC> telnet 192.168.3.1
```

This connection should fail because **R3** has been configured to accept only SSH connections on the virtual terminal lines.

Step 9: Connect to R3 using SSH on PC-C.

Open the Desktop of **PC-C**. Select the Command Prompt icon. From **PC-C**, enter the command to connect to R3 via SSH. When prompted for the password, enter the password configured for the administrator **ciscosshpa55**.

```
PC> ssh –l SSHadmin 192.168.3.1
```

Step 10: Connect to R3 using SSH on R2.

To troubleshoot and maintain **R3**, the administrator at the ISP must use SSH to access the router CLI. From the CLI of **R2**, enter the command to connect to **R3** via SSH version **2** using the **SSHadmin** user account. When prompted for the password, enter the password configured for the administrator: **ciscosshpa55**.

```
R2# ssh –v 2 –l SSHadmin 10.2.2.1
```