

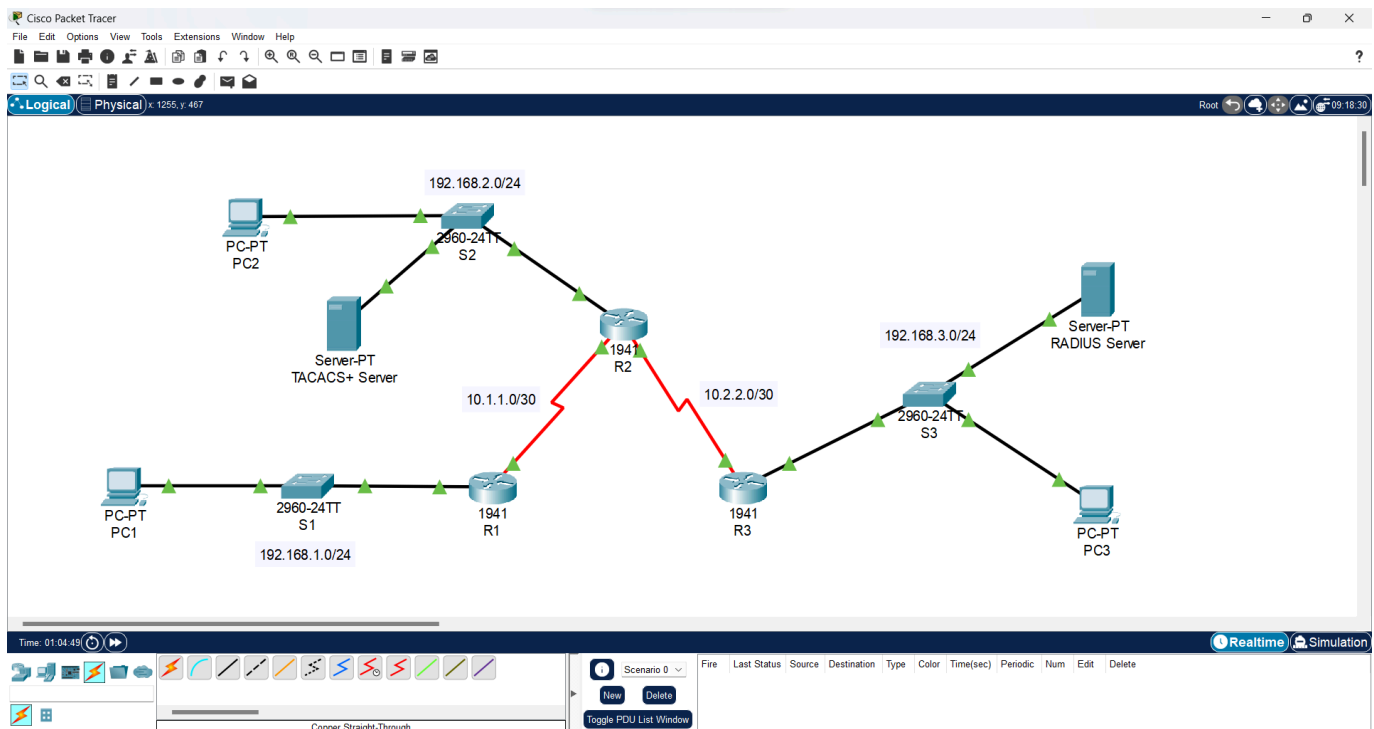
Security in Computing

Practical - 2

➤ Aim: Configure AAA Authentication

- Configure a local user account on Router and configure authentication on the console and vty lines using local AAA.
- Verify local AAA authentication from the Router console and the PC1 client.

Topology Diagram:



Assign IP Addresses:

The screenshot shows the configuration window for PC1 in Cisco Packet Tracer. The 'Desktop' tab is selected, and the 'IP Configuration' section is expanded. The configuration is set to 'Static'.

Interface	IP Configuration
FastEthernet0	<input type="radio"/> DHCP <input checked="" type="radio"/> Static
IPv4 Address	192.168.1.3
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0

PC2

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.2.3

Subnet Mask 255.255.255.0

Default Gateway 192.168.2.1

DNS Server 0.0.0.0

PC3

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.3.3

Subnet Mask 255.255.255.0

Default Gateway 192.168.3.1

DNS Server 0.0.0.0

TACACS+ Server

Physical Config Services **Desktop** Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.2.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.2.1

DNS Server 0.0.0.0

RADIUS Server

Physical Config Services **Desktop** Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.3.2

Subnet Mask 255.255.255.0

Default Gateway 192.168.3.1

DNS Server 0.0.0.0

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#host R1
R1(config)#interface GigabitEthernet0/1
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

R1(config-if)#interface Serial0/0/0
R1(config-if)#ip address 10.1.1.2 255.255.255.252
R1(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R1(config-if)#
R1(config-if)#^Z
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#exit

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#host R2
R2(config)#interface GigabitEthernet0/0
R2(config-if)#ip address 192.168.2.1 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

R2(config-if)#interface Serial0/0/0
R2(config-if)#ip address 10.1.1.1 255.255.255.252
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

R2(config-if)#interface Serial0/0/1
R2(config-if)#ip address 10.2.2.1 255.255.255.252
R2(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
R2(config-if)#^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#exit

```

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#host R3
R3(config)#interface GigabitEthernet0/1
R3(config-if)#ip address 192.168.3.1 255.255.255.0
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

R3(config-if)#interface Serial0/0/1
R3(config-if)#ip address 10.2.2.2 255.255.255.252
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

R3(config-if)#^Z
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#exit

```

Displaying IP Address details of Routers:

R1>show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	administratively down	down
GigabitEthernet0/1	192.168.1.1	YES	manual	up	up
Serial0/0/0	10.1.1.2	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

R2>show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	192.168.2.1	YES	manual	up	up
GigabitEthernet0/1	unassigned	YES	unset	administratively down	down
Serial0/0/0	10.1.1.1	YES	manual	up	up
Serial0/0/1	10.2.2.1	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

R3>show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	administratively down	down
GigabitEthernet0/1	192.168.3.1	YES	manual	up	up
Serial0/0/0	unassigned	YES	unset	administratively down	down
Serial0/0/1	10.2.2.2	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

Configure RIP on Routers:

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router rip
R1(config-router)#network 192.168.1.0
R1(config-router)#network 10.1.1.0
R1(config-router)#^Z
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#exit
```

```
R2>en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router rip
R2(config-router)#network 10.1.1.0
R2(config-router)#network 192.168.2.0
R2(config-router)#network 10.2.2.0
R2(config-router)#^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#exit
```

```
R3>en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router rip
R3(config-router)#network 192.168.3.0
R3(config-router)#network 10.2.2.0
R3(config-router)#^Z
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#exit
```

Displaying Routing Tables of Routers:

```
R1>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

Gateway of last resort is not set

```

    10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C       10.1.1.0/30 is directly connected, Serial0/0/0
L       10.1.1.2/32 is directly connected, Serial0/0/0
R       10.2.2.0/30 [120/1] via 10.1.1.1, 00:00:02, Serial0/0/0
    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/1
L       192.168.1.1/32 is directly connected, GigabitEthernet0/1
R       192.168.2.0/24 [120/1] via 10.1.1.1, 00:00:02, Serial0/0/0
R       192.168.3.0/24 [120/2] via 10.1.1.1, 00:00:02, Serial0/0/0
```

```
R2>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

Gateway of last resort is not set

```

    10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.1.1.0/30 is directly connected, Serial0/0/0
L       10.1.1.1/32 is directly connected, Serial0/0/0
C       10.2.2.0/30 is directly connected, Serial0/0/1
L       10.2.2.1/32 is directly connected, Serial0/0/1
R       192.168.1.0/24 [120/1] via 10.1.1.2, 00:00:11, Serial0/0/0
    192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/0
L       192.168.2.1/32 is directly connected, GigabitEthernet0/0
R       192.168.3.0/24 [120/1] via 10.2.2.2, 00:00:25, Serial0/0/1
```

```
R3>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

Gateway of last resort is not set

```

    10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
R       10.1.1.0/30 [120/1] via 10.2.2.1, 00:00:10, Serial0/0/1
C       10.2.2.0/30 is directly connected, Serial0/0/1
L       10.2.2.2/32 is directly connected, Serial0/0/1
R       192.168.1.0/24 [120/2] via 10.2.2.1, 00:00:10, Serial0/0/1
R       192.168.2.0/24 [120/1] via 10.2.2.1, 00:00:10, Serial0/0/1
    192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, GigabitEthernet0/1
L       192.168.3.1/32 is directly connected, GigabitEthernet0/1
```

Configure Local AAA Authentication for Console Lines on R1:

```
R1>en
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#username aaaAdmin secret aaapwd
R1(config)#aaa new-model
R1(config)#aaa authentication login default local
R1(config)#line console 0
R1(config-line)#login authentication default
R1(config-line)#^Z
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#exit
```

User Access Verification

```
Username: aaaAdmin
Password:
R1>|
```

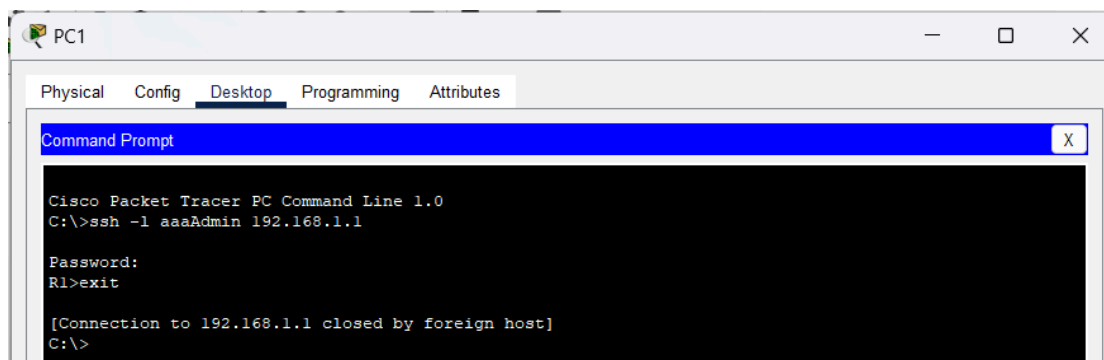
Configure Local AAA Authentication for VTY Lines on R1

```
R1>en
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip domain-name sic.com
R1(config)#crypto key generate rsa
The name for the keys will be: R1.sic.com
Choose the size of the key modulus in the range of 360 to 4096 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]

R1(config)#aaa authentication login SSH-LOGIN local
*Mar 1 0:44:16.390: %SSH-5-ENABLED: SSH 1.99 has been enabled
R1(config)#line vty 0 4
R1(config-line)#login authentication SSH-LOGIN
R1(config-line)#transport input ssh
R1(config-line)#^Z
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#exit
```



Configure Server-Based AAA Authentication Using TACACS+ on R2:

TACACS+ Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

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

AAA

Service ☒ On ☐ Off Radius Port 1645

Network Configuration

Client Name Client IP

Secret ServerType Radius

	Client Name	Client IP	Server Type	Key	
1	R2	192.168.2.1	Tacacs	tacacspwd	<input type="button" value="Add"/>

User Setup

Username Password

	Username	Password	
1	admin2	pwd2	<input type="button" value="Add"/>

☐ Top

```
R2>en
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#username admin2 secret pwd2
R2(config)#tacacs-server host 192.168.2.2
R2(config)#tacacs-server key tacacspwd
R2(config)#aaa new-model
R2(config)#aaa authentication login default group tacacs+ local
R2(config)#line console 0
R2(config-line)#login authentication default
R2(config-line)#^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#exit
```

User Access Verification

```
Username: admin2
Password:
R2>
```


Configure Server-Based AAA Authentication Using RADIUS on R3:

The screenshot shows the 'RADIUS Server' configuration window with the 'Services' tab selected. The 'AAA' service is highlighted in the left sidebar. The main configuration area is titled 'AAA' and includes the following sections:

- Service:** A radio button group with 'On' selected and 'Off' unselected. The 'Radius Port' is set to '1645'.
- Network Configuration:**
 - Client Name: (empty field)
 - Client IP: (empty field)
 - Secret: (empty field)
 - ServerType: A dropdown menu with 'Radius' selected.
 - A table with columns: Client Name, Client IP, Server Type, Key. It contains one entry: '1 R3', '192.168.3.1', 'Radius', 'radiuspwd'. Buttons 'Add', 'Save', and 'Remove' are to the right.
- User Setup:**
 - Username: (empty field)
 - Password: (empty field)
 - A table with columns: Username, Password. It contains one entry: '1 admin3', 'pwd3'. Buttons 'Add', 'Save', and 'Remove' are to the right.

At the bottom left, there is a 'Top' button.

```
R3>en
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#username admin3 secret pwd3
R3(config)#radius-server host 192.168.3.2
R3(config)#radius-server key radiuspwd
R3(config)#aaa new-model
R3(config)#aaa authentication login default group radius local
R3(config)#line console 0
R3(config-line)#login authentication default
R3(config-line)#^Z
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#exit
```

User Access Verification

```
Username: admin3
Password:
R3>
```