



A SECURE MULTI-BRANCH OFFICE NETWORK

Our Team

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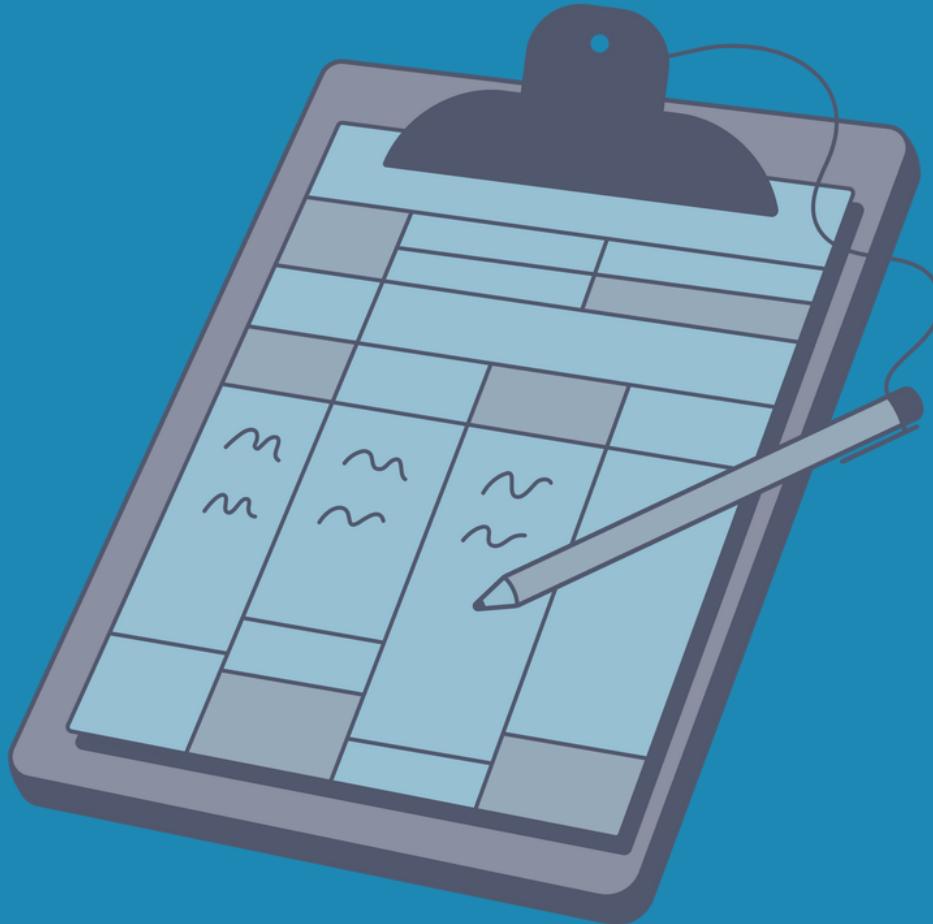
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Omar Mohammad

Agenda

Topics Covered



1

Scenario

2

Key Challenges

3

Objective

4

Topology Analysis

5

Components

6

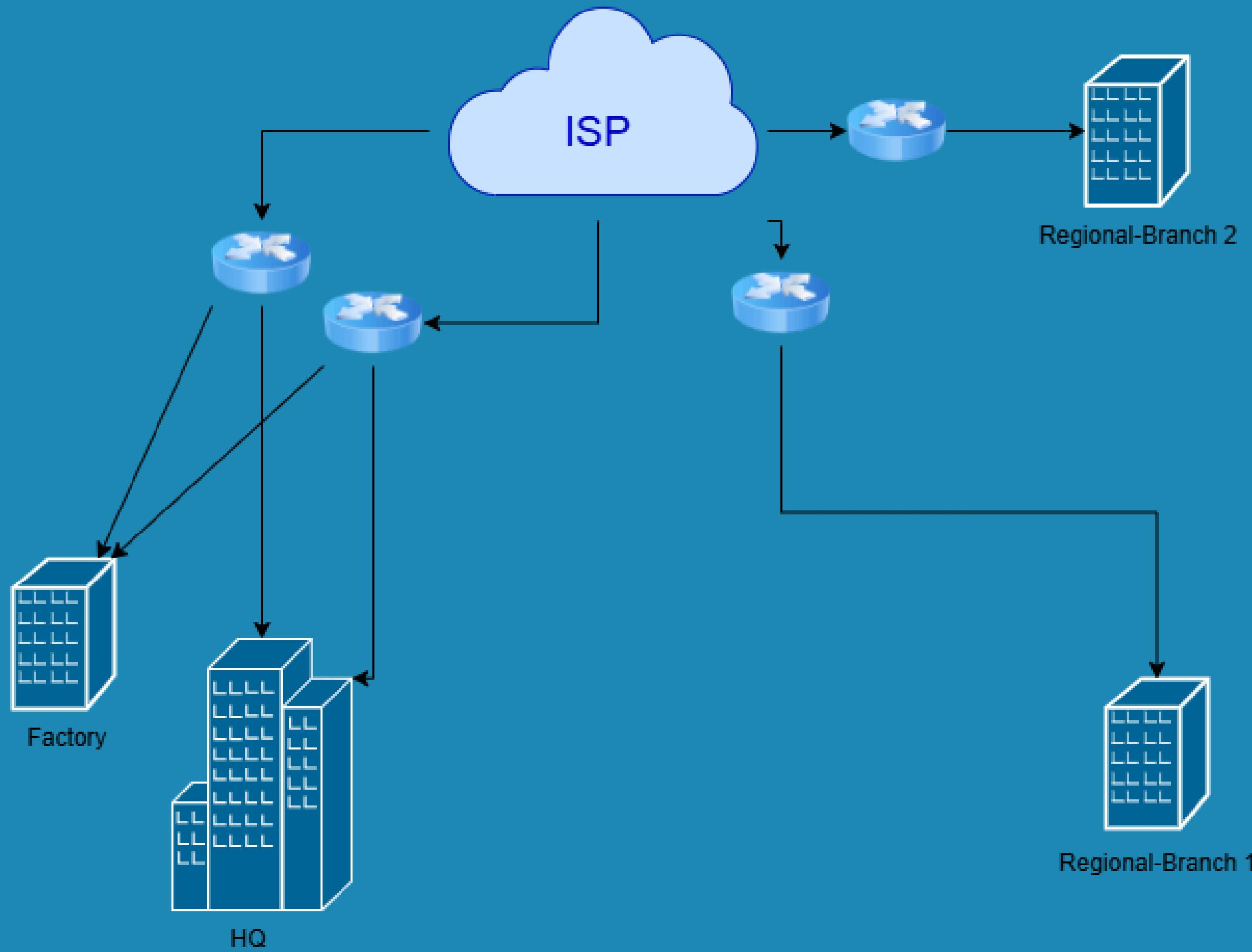
Demo

7

Results

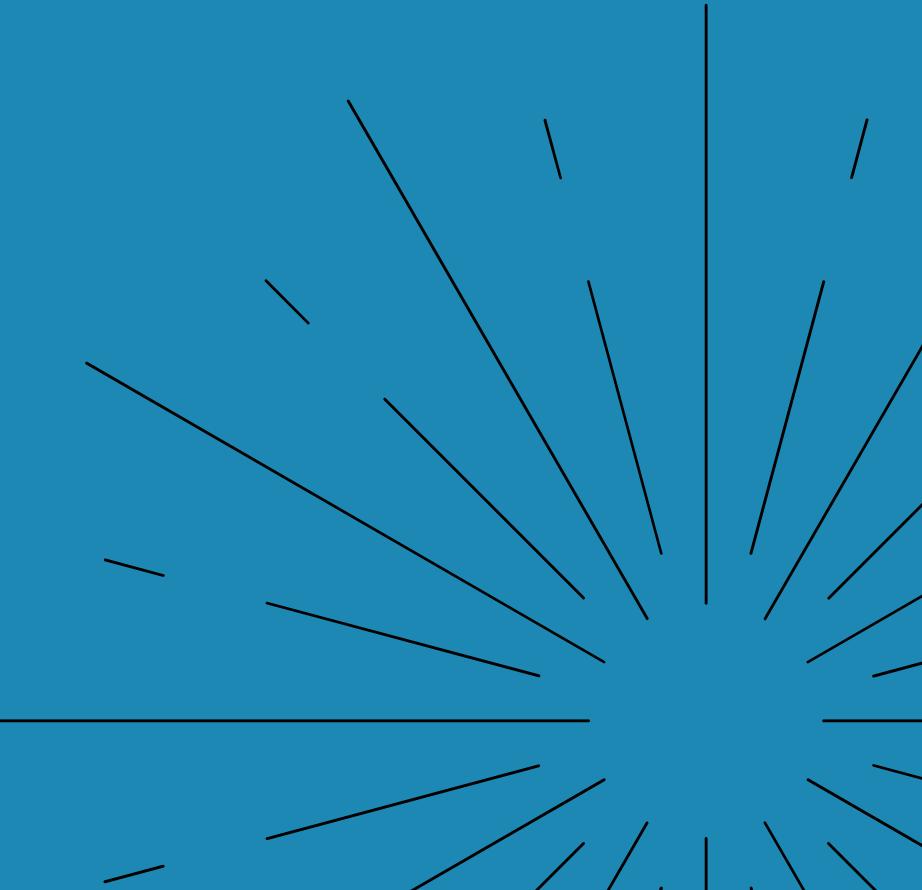
SCENARIO



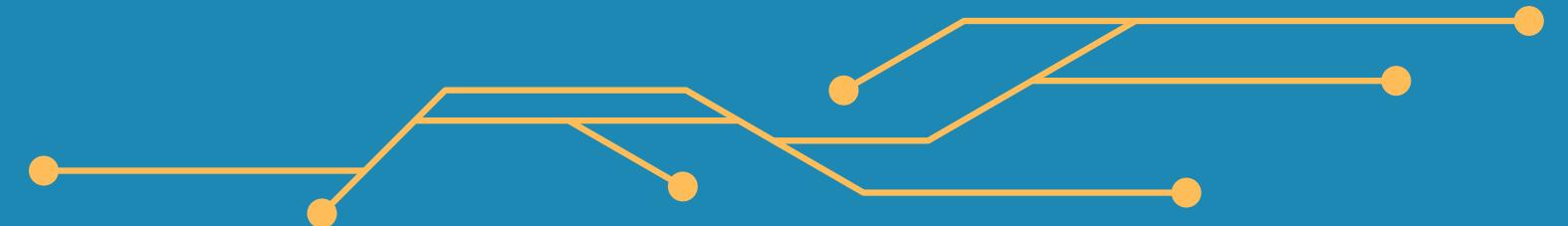
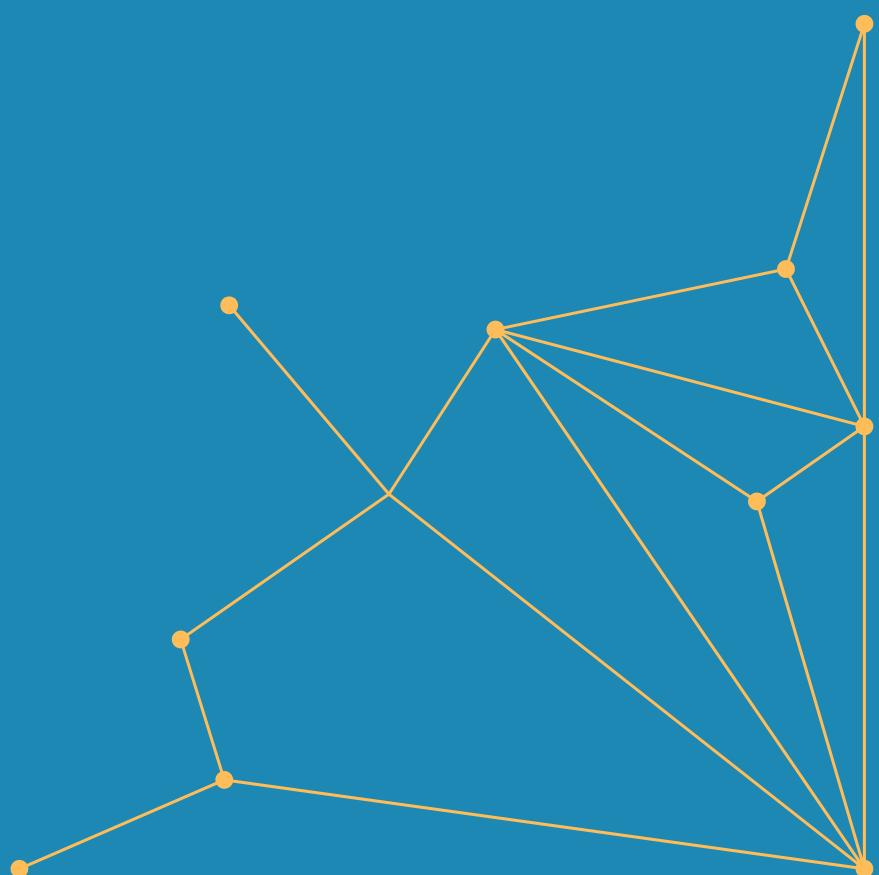
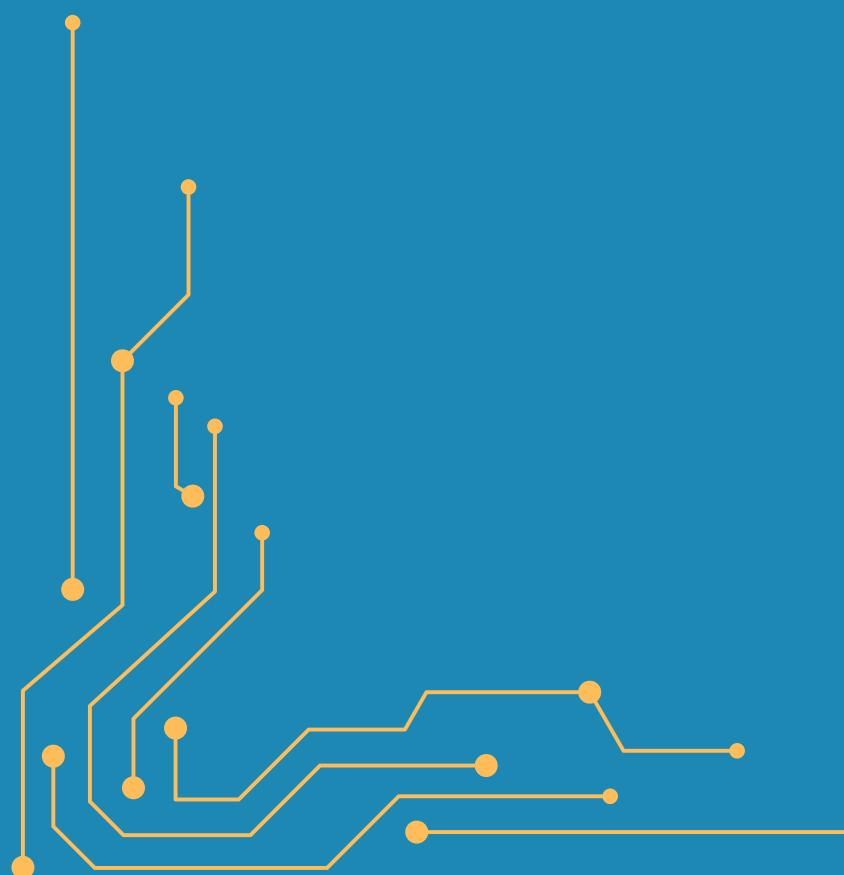


SCENARIO

- A company operates a main office and three branch offices
- Requirements:
 - Secure site-to-site communication
 - Department-based segmentation
 - Cyber threat protection
 - Reliable internet access



KEY CHALLENGE



Design

1

- No Single points of failure
- Through structuring a fully redundant network with dual data paths.

2

Scalability for Future Growth

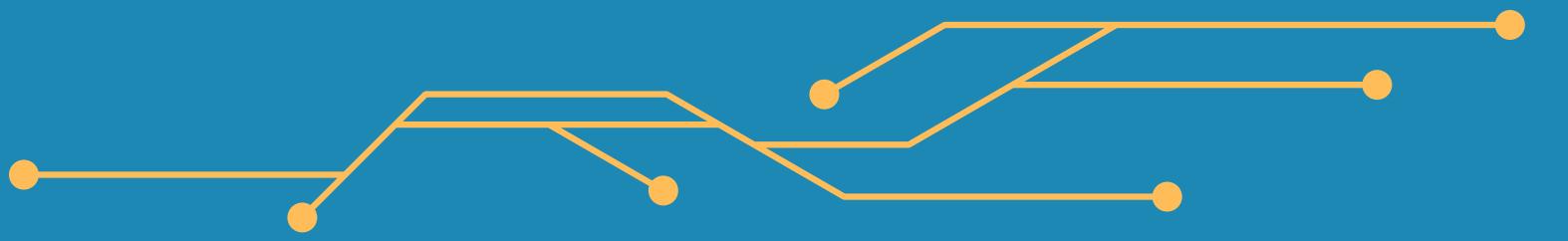
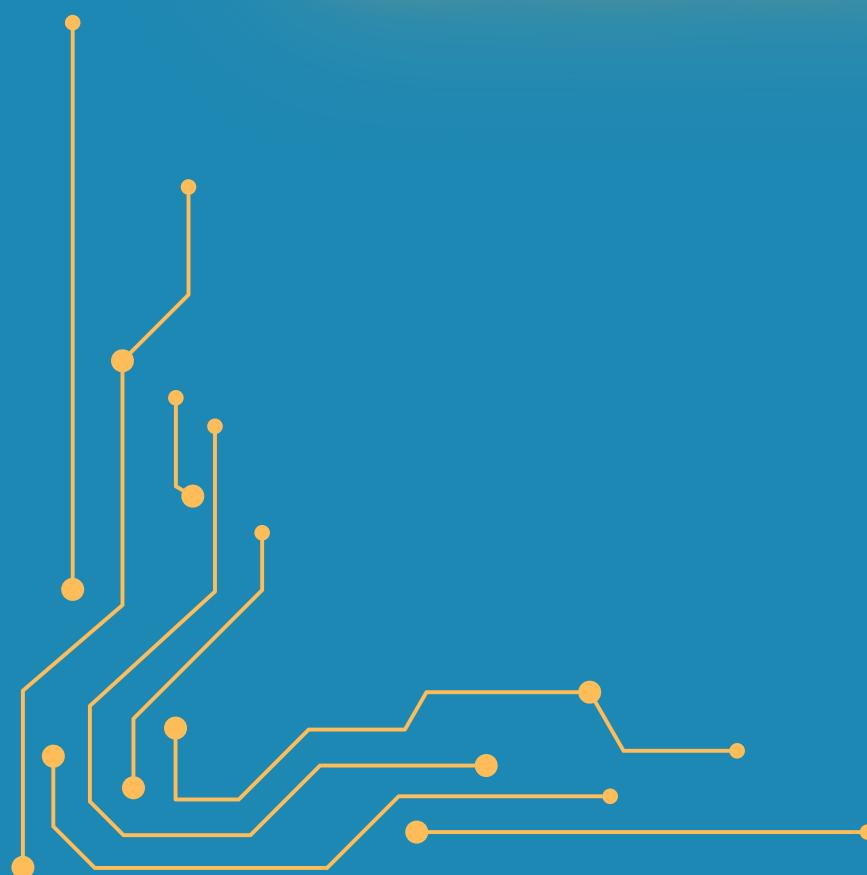
- Accommodate new branches and devices .

3

Security

- Secure Communication Between Branches
- Unauthorized Access & Attacks

OBJECTIVE



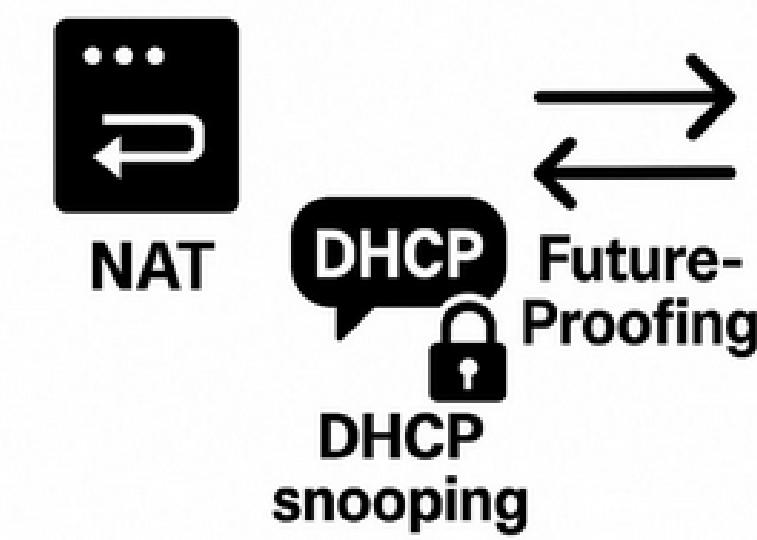
1

Design a Cost-Effective, Scalable Multi-Branch Network



2

Integrate Core Enterprise Technologies

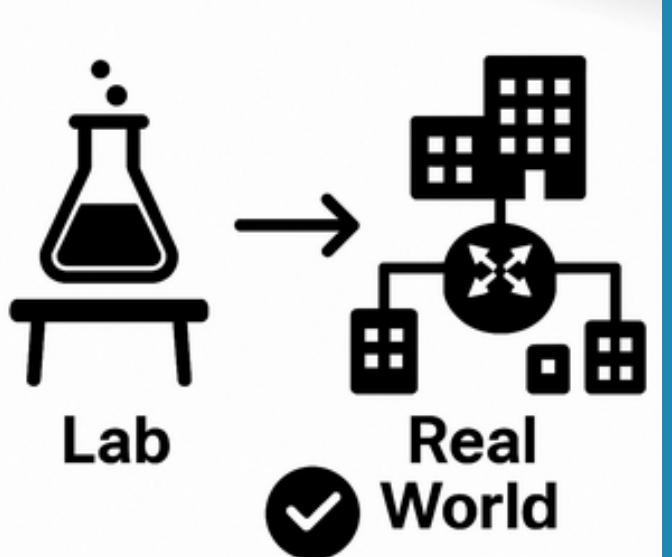


3

Optimize Network Resources and Enhance Security

4

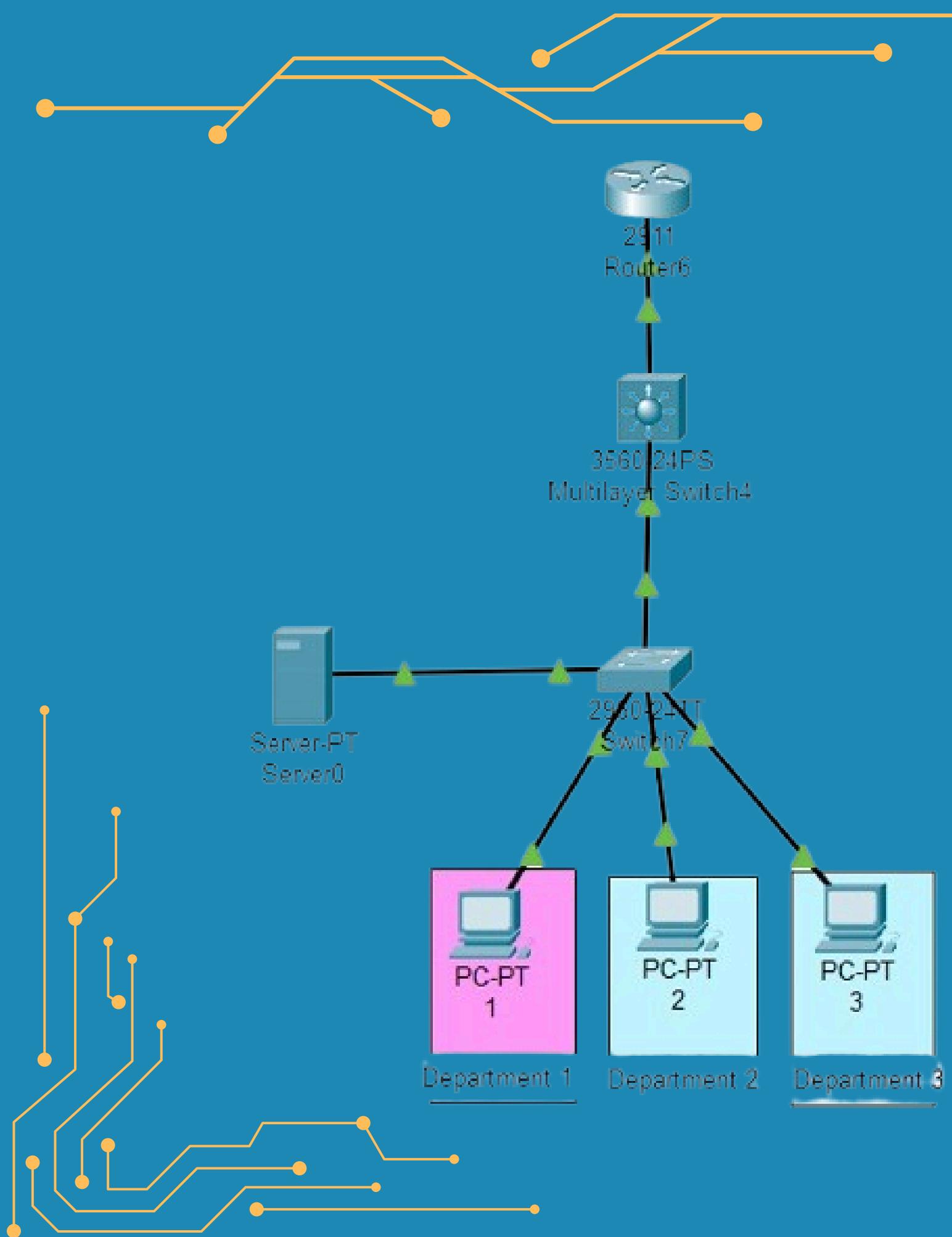
Bridge Theory with Practical Application





NETWORK TOPOLOGY

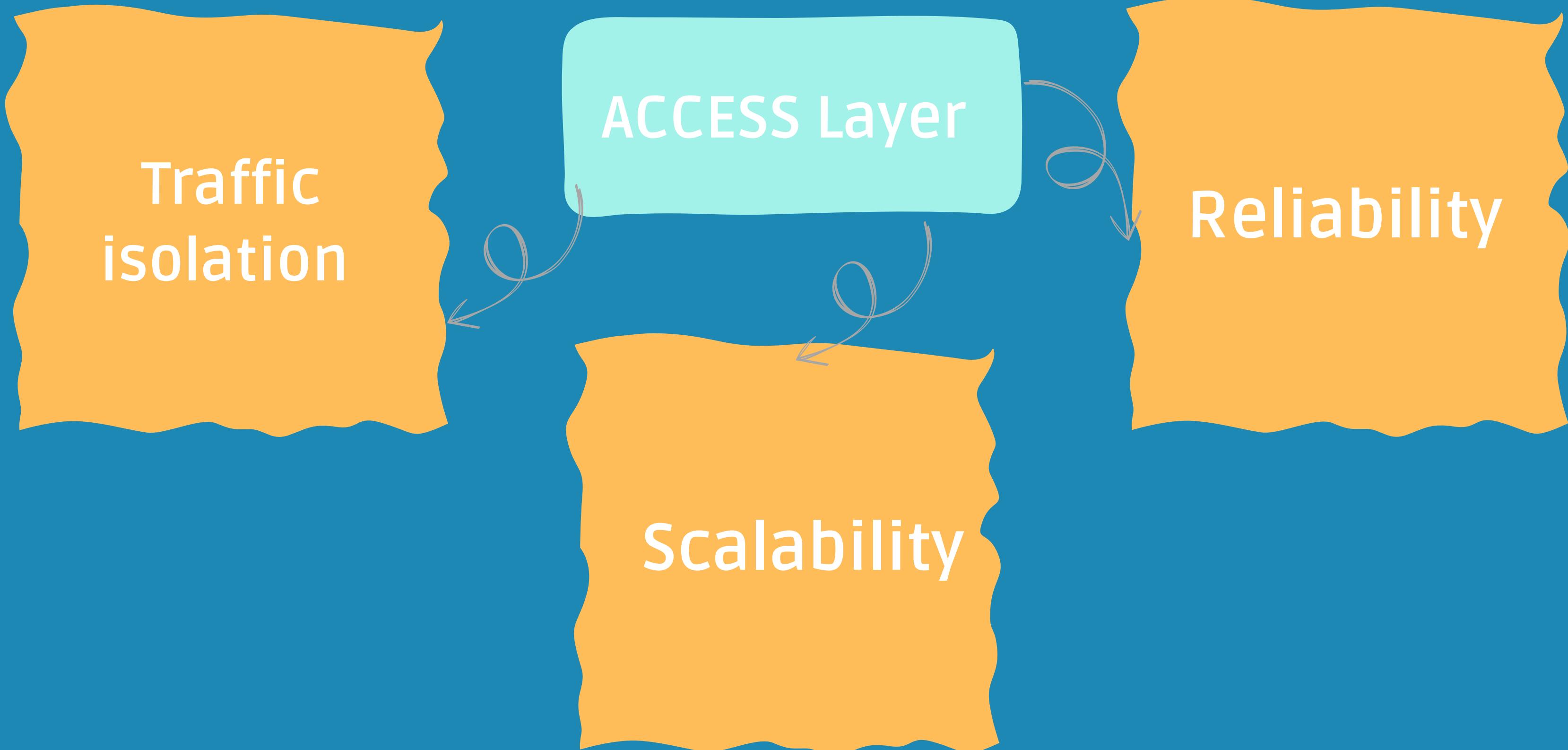




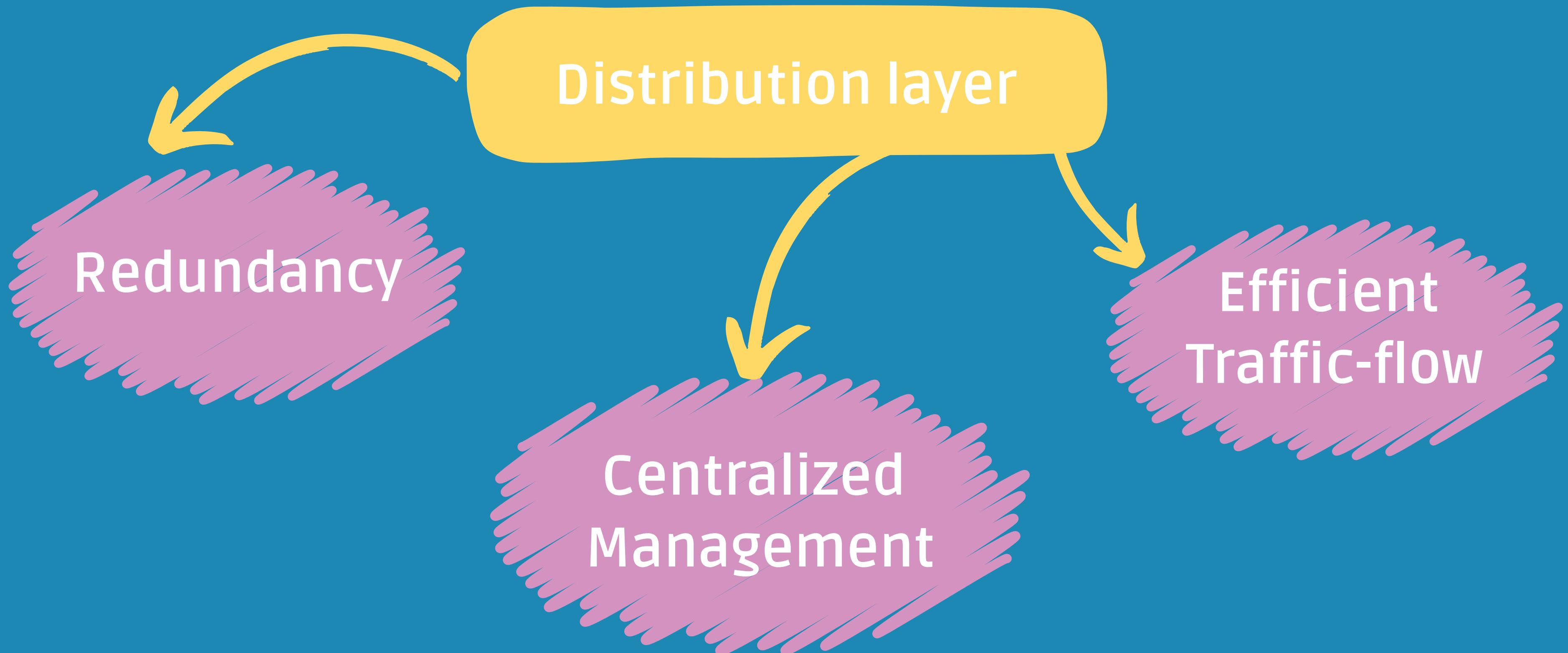
VLAN CONFIGURATION AND INTER-VLAN ROUTING

- VLAN 2: R&D
- VLAN 3: Marketing
- VLAN 4: Operation
- VLAN 5: IT
- VLAN 6: HR
- VLAN 7: Wireless

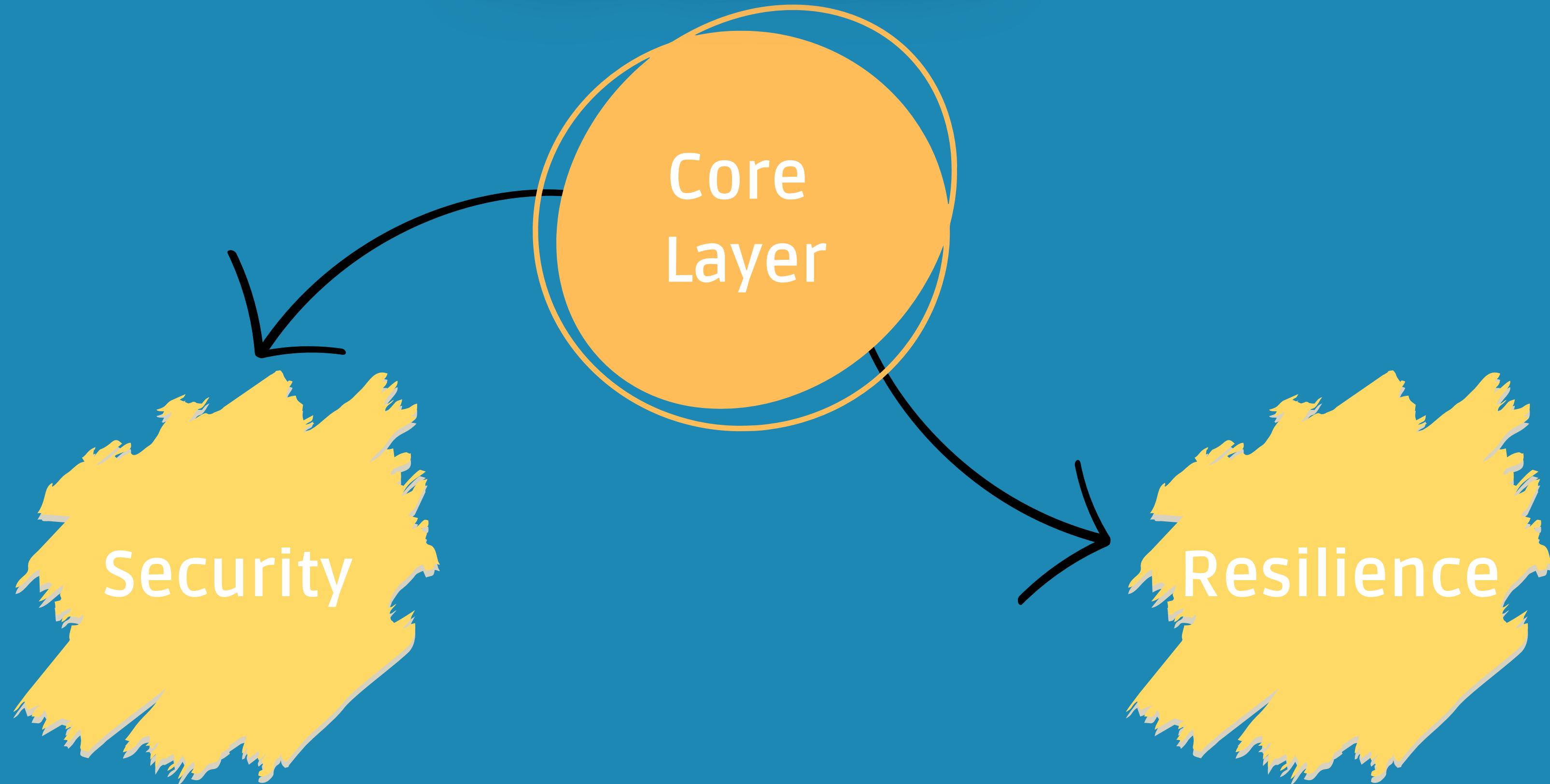
TOPOLOGY

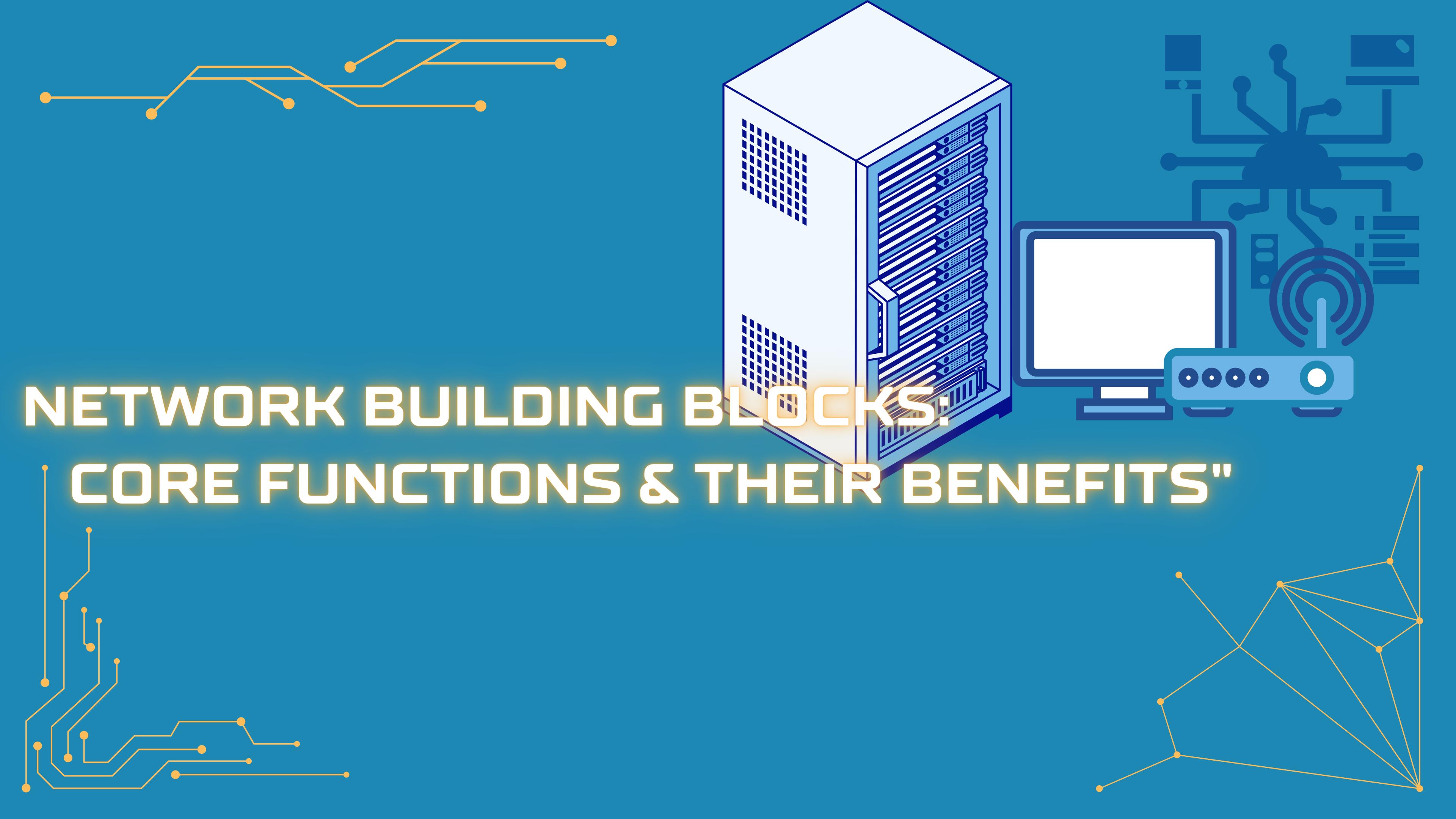


TOPOLOGY



TOPOLOGY





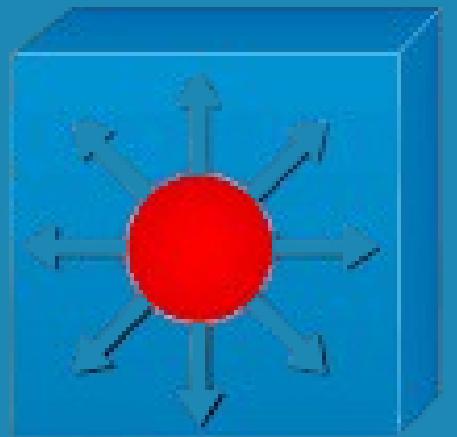
NETWORK BUILDING BLOCKS: CORE FUNCTIONS & THEIR BENEFITS"

COMPONENTS

1 SWITCH

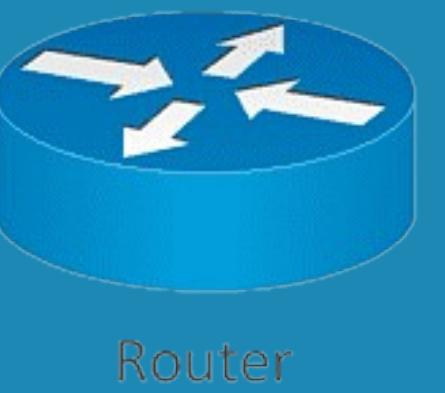


2 MULTILAYER SWITCH



Multilayer switch

3 ROUTER



Router

4 SERVER



COMPONENTS

1. Layer 2 switch

Key Takeaways



1. PURE LAYER 2 SWITCHING

- Intra-VLAN traffic is managed at the Layer 2 level to prevent unnecessary load on Layer 3 devices.
- VLAN segmentation for security (HR, Marketing, IT, etc.).



2. REDUNDANCY & LOAD BALANCING

- EtherChannel (Port-Channel) prevents loops while aggregating bandwidth.
- STP ensures a loop-free topology with optimized paths.



3. SECURITY

- VLAN 1 disabled.
- Unused ports are inactive.

COMPONENTS

2. Multi-layer switches

Key Takeaways



1. CORE ROUTING & SWITCHING

- Inter-VLAN routing (ip routing).
- OSPF for dynamic routing.



2. HIGH AVAILABILITY

- HSRP ensures redundant gateways for all VLANs.
- Rapid PVST+ for fast convergence.



3. SECURITY & MANAGEMENT

- NTP for time sync.
- SNMP for monitoring and controlling.
- Syslog for centralized logging.

COMPONENTS

3.Routers

Key Takeaways

1

VPN: Securely connects branches via
IPSec (AES/SHA).

2

HSRP/OSPF: Ensures redundancy
and dynamic routing.

3

Firewall: Restricts Factory/Main Branch traffic to
permitted protocols(SMB/RDB/HTTP/HTTPS).

4

Firewall Rules: Allow only
necessary ports (e.g., UDP/67 for
DHCP, TCP/445 for SMB)

Components

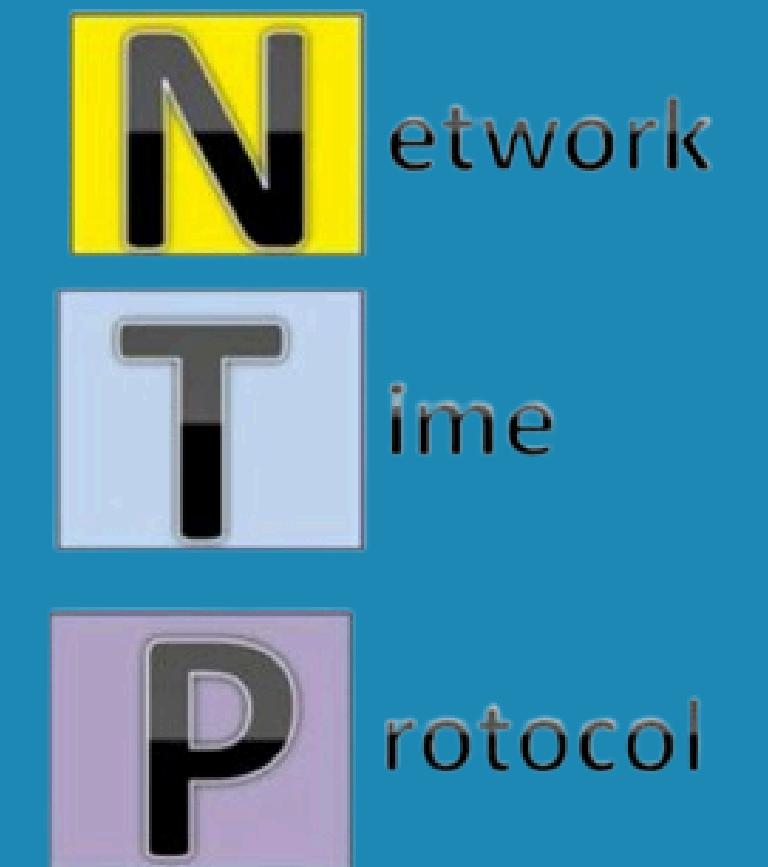
4.Servers

Key Security Considerations

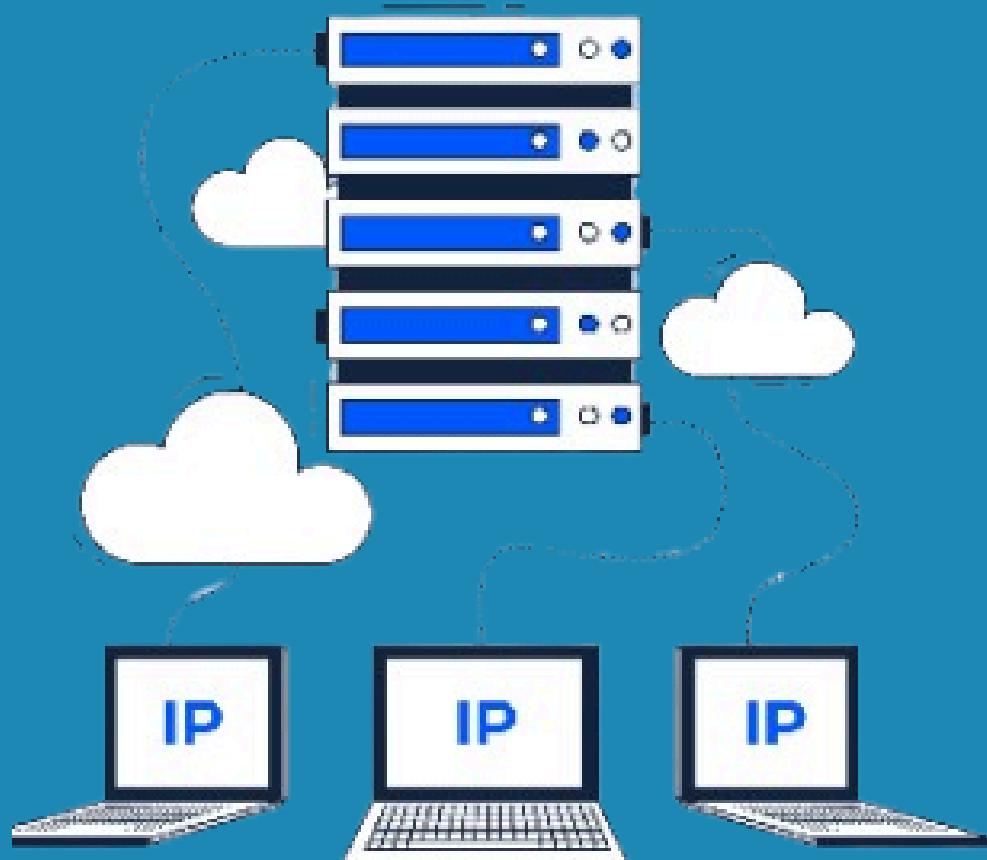
1-AAA



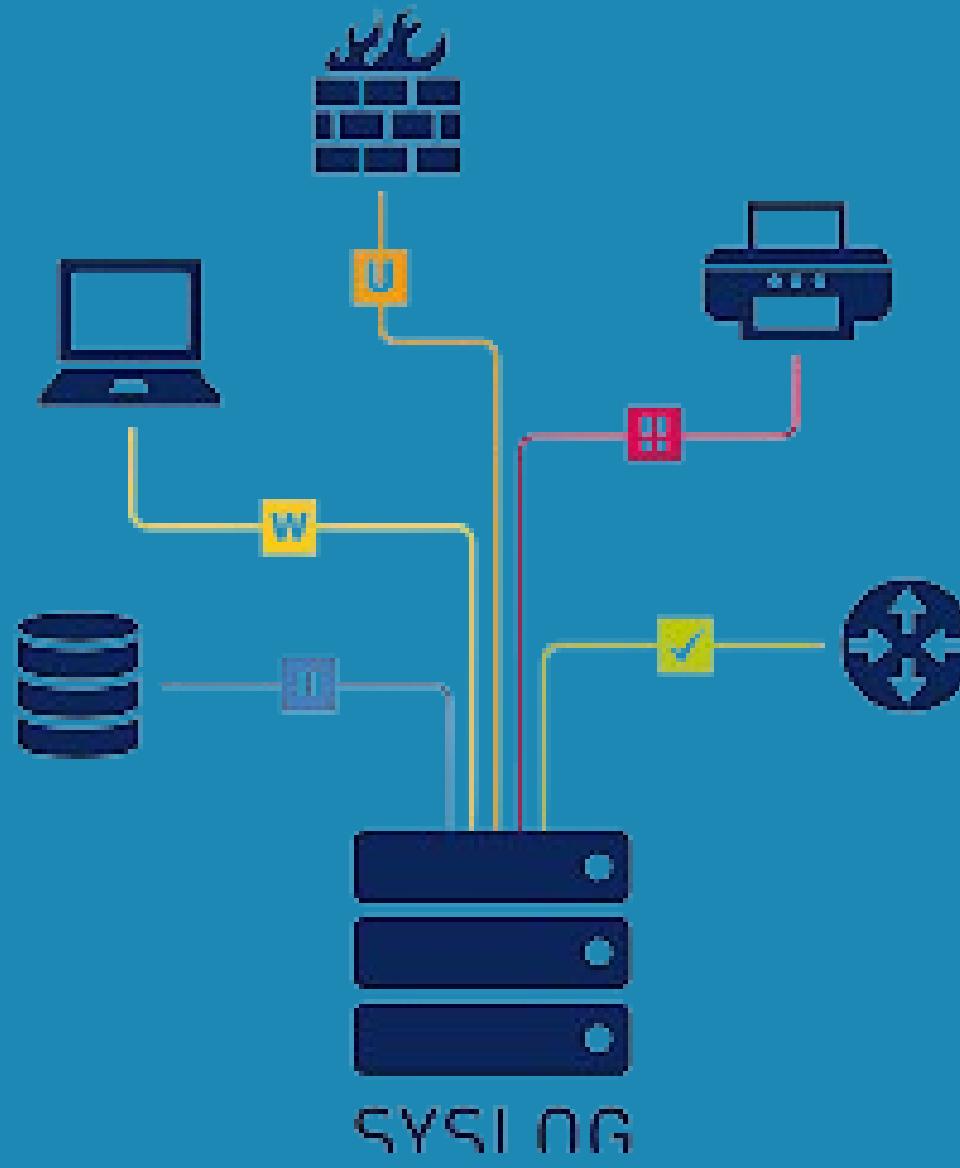
2-NTP



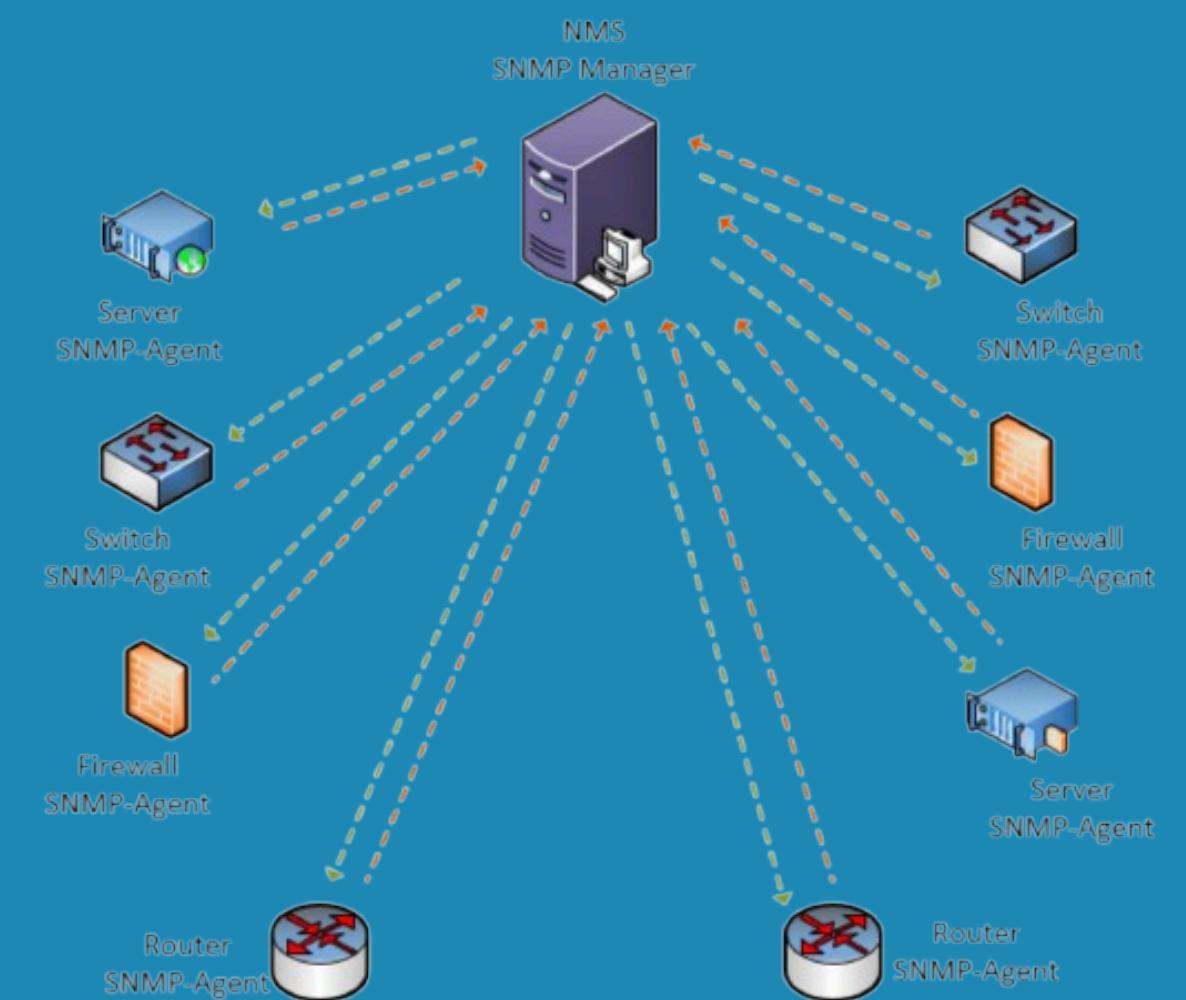
3-DHCP



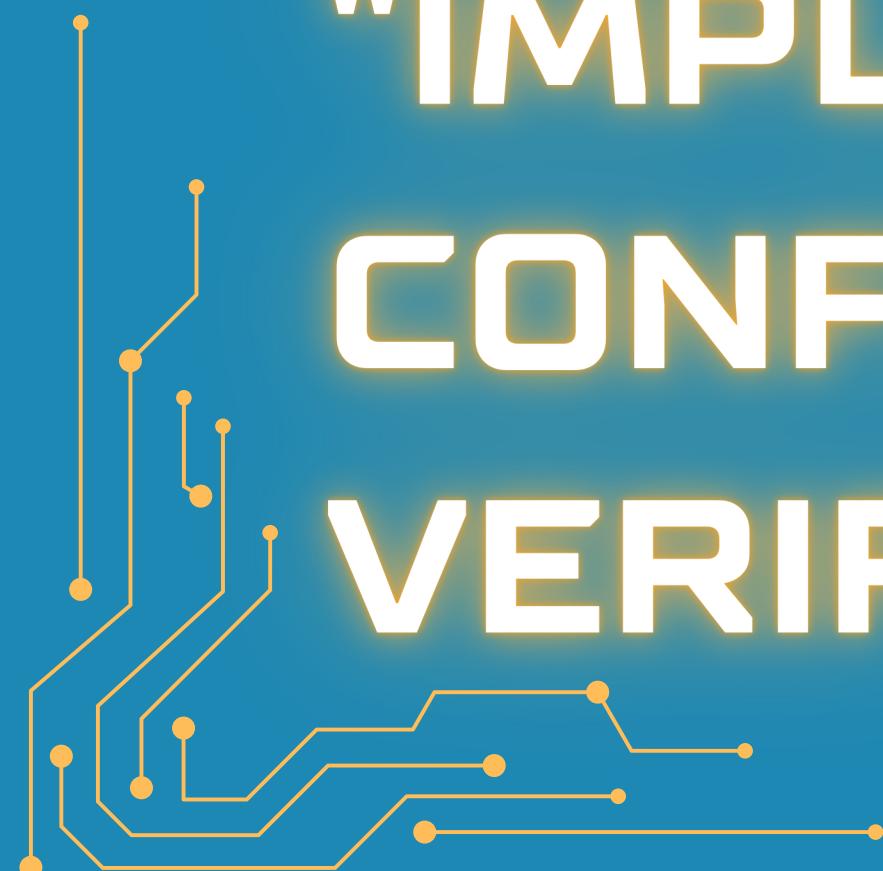
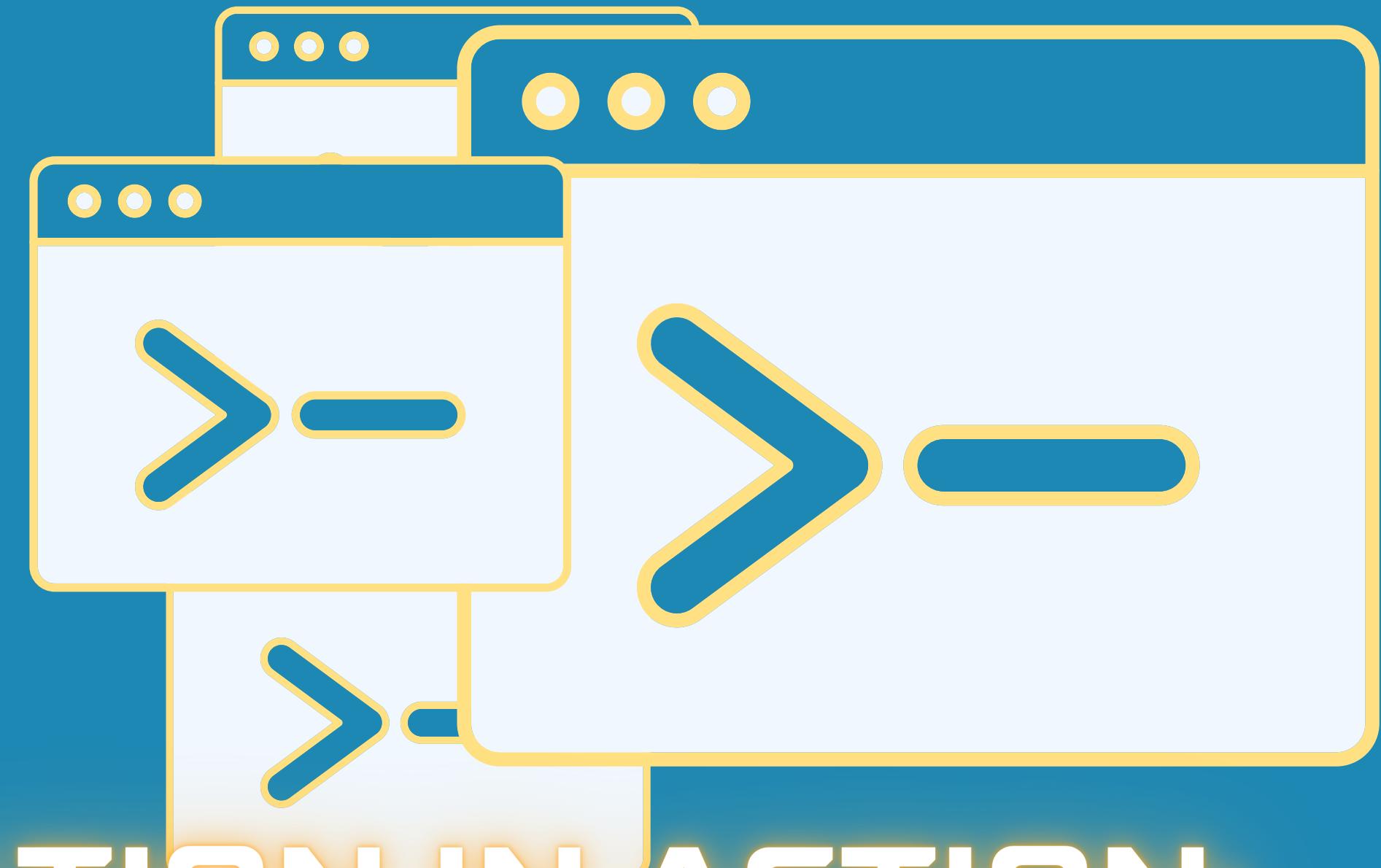
4-SYSLOG



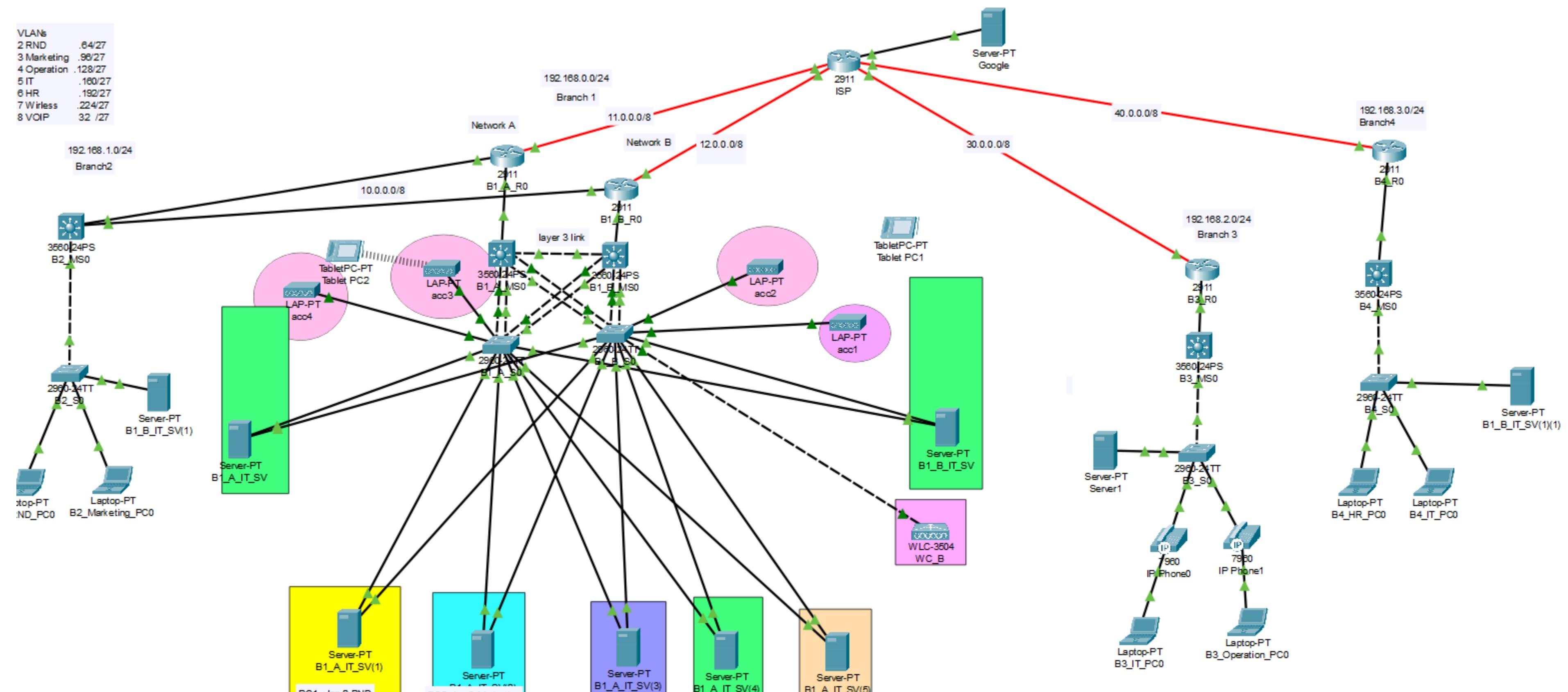
5-SNMP



"IMPLEMENTATION IN ACTION: CONFIGURATIONS & VERIFICATIONS"



VLANs	
2 RND	.64/27
3 Marketing	.96/27
4 Operation	.128/27
5 IT	.160/27
6 HR	.192/27
7 Wireless	.224/27
8 VOIP	.32 /27



B1_A_MS0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
VLAN0002
Spanning tree enabled protocol rstp
Root ID Priority 4098
Address 000B.BE50.EE56
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 4098 (priority 4096 sys-id-ext 2)
Address 000B.BE50.EE56
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
----- ----- ----- -----
Po2 Desg FWD 12 128.28 Shr
Po1 Desg FWD 12 128.27 Shr

VLAN0003
Spanning tree enabled protocol rstp
Root ID Priority 4099
Address 000B.BE50.EE56
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 4099 (priority 4096 sys-id-ext 3)
Address 000B.BE50.EE56
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
----- ----- ----- -----
Po2 Desg FWD 12 128.28 Shr
Po1 Desg FWD 12 128.27 Shr
```

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Top

B1_B_MS0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
VLAN0004
Spanning tree enabled protocol rstp
Root ID Priority 4100
Address 000B.BE50.EE56
Cost 24
Port 27(Port-channel1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 8196 (priority 8192 sys-id-ext 4)
Address 0000.0CA8.D68A
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
----- ----- ----- -----
Po2 Altn BLK 12 128.28 Shr
Po1 Root FWD 12 128.27 Shr

VLAN0005
Spanning tree enabled protocol rstp
Root ID Priority 4101
Address 000B.BE50.EE56
Cost 24
Port 27(Port-channel1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 8197 (priority 8192 sys-id-ext 5)
Address 0000.0CA8.D68A
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
----- ----- ----- -----
Po2 Altn BLK 12 128.28 Shr
Po1 Root FWD 12 128.27 Shr
```

Copy **Paste**

B1_B_MS0

dir dir

B1_B_MS0#sh standby b

P indicates configured to preempt.

|

Interface	Grp	Pri	P	State	Active	Standby	Virtual IP
V12	2	100	P	Standby	192.168.0.67	local	192.168.0.65
V13	3	100	P	Standby	192.168.0.99	local	192.168.0.97
V14	4	100	P	Standby	192.168.0.131	local	192.168.0.129
V15	5	100	P	Standby	192.168.0.163	local	192.168.0.161
V16	6	100	P	Standby	192.168.0.195	local	192.168.0.193
V17	7	100	P	Standby	192.168.0.227	local	192.168.0.225

B1_A_MS0

dir dir

<cr>

B1_A_MS0#sh standby b

P indicates configured to preempt.

|

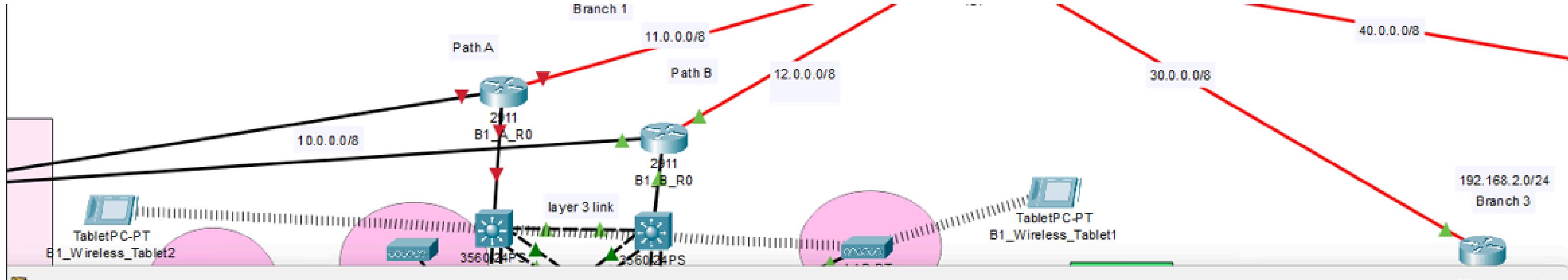
Interface	Grp	Pri	P	State	Active	Standby	Virtual IP
V12	2	105	P	Active	local	192.168.0.66	192.168.0.65
V13	3	105	P	Active	local	192.168.0.98	192.168.0.97
V14	4	105	P	Active	local	192.168.0.130	192.168.0.129
V15	5	105	P	Active	local	192.168.0.162	192.168.0.161
V16	6	105	P	Active	local	192.168.0.194	192.168.0.193
V17	7	105	P	Active	local	192.168.0.226	192.168.0.225

B1_A_MS0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
direct direct
<cr>
B1_A_MS0#sh standby b
          P indicates configured to preempt.
          |
Interface  Grp  Pri  P State    Active      Standby      Virtual IP
V12        2     105  P Active   local       192.168.0.66  192.168.0.65
V13        3     105  P Active   local       192.168.0.98  192.168.0.97
V14        4     105  P Active   local       192.168.0.130 192.168.0.129
V15        5     105  P Active   local       192.168.0.162 192.168.0.161
V16        6     105  P Active   local       192.168.0.194 192.168.0.193
V17        7     105  P Active   local       192.168.0.226 192.168.0.225
B1_A_MS0#
*Apr 14, 12:17:24.1717: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to down
*Apr 14, 12:17:24.1717: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to down
*Apr 14, 12:17:24.1717: 12:17:24: %OSPF-5-ADJCHG: Process 1, Nbr 10.0.0.1 on GigabitEthernet0/1 from FULL to DOWN, Neighbor Down: Interface down or detached
*Apr 14, 12:17:43.1717: %HSRP-6-STATECHANGE: Vlan4 Grp 4 state Speak -> Standby
*Apr 14, 12:17:45.1717: %HSRP-6-STATECHANGE: Vlan3 Grp 3 state Speak -> Standby
*Apr 14, 12:17:45.1717: %HSRP-6-STATECHANGE: Vlan5 Grp 5 state Speak -> Standby
*Apr 14, 12:17:45.1717: %HSRP-6-STATECHANGE: Vlan7 Grp 7 state Speak -> Standby
*Apr 14, 12:17:46.1717: %HSRP-6-STATECHANGE: Vlan6 Grp 6 state Speak -> Standby
*Apr 14, 12:17:46.1717: %HSRP-6-STATECHANGE: Vlan2 Grp 2 state Speak -> Standby
standby b
          P indicates configured to preempt.
          |
Interface  Grp  Pri  P State    Active      Standby      Virtual IP
V12        2     95   P Standby  192.168.0.66  local       192.168.0.65
V13        3     95   P Standby  192.168.0.98  local       192.168.0.97
V14        4     95   P Standby  192.168.0.130 local       192.168.0.129
V15        5     95   P Standby  192.168.0.162 local       192.168.0.161
V16        6     95   P Standby  192.168.0.194 local       192.168.0.193
V17        7     95   P Standby  192.168.0.226 local       192.168.0.225
```



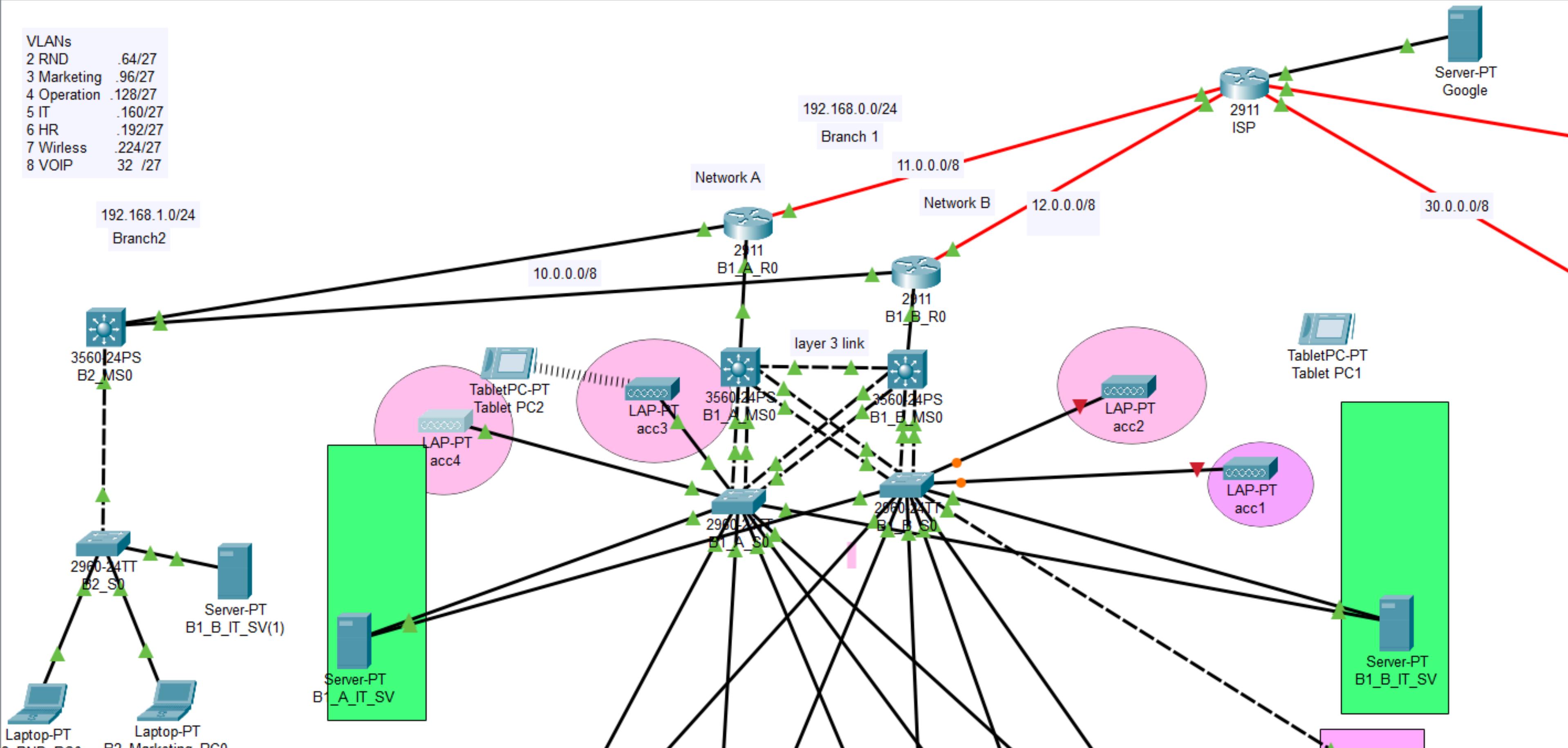
```
B1_B_MS0#sh standby b
          P indicates configured to preempt.

Interface  Grp Pri P State      Active           Standby          Virtual IP
V12        2   100 P Standby    192.168.0.67    local            192.168.0.65
V13        3   100 P Standby    192.168.0.99    local            192.168.0.97
V14        4   100 P Standby    192.168.0.131   local            192.168.0.129
V15        5   100 P Standby    192.168.0.163   local            192.168.0.161
V16        6   100 P Standby    192.168.0.195   local            192.168.0.193
V17        7   100 P Standby    192.168.0.227   local            192.168.0.225

B1_B_MS0#
*Apr 14, 12:17:26.1717: %HSRP-6-STATECHANGE: Vlan4 Grp 4 state Standby -> Active
*Apr 14, 12:17:26.1717: %HSRP-6-STATECHANGE: Vlan7 Grp 7 state Standby -> Active
*Apr 14, 12:17:26.1717: %HSRP-6-STATECHANGE: Vlan5 Grp 5 state Standby -> Active
*Apr 14, 12:17:26.1717: %HSRP-6-STATECHANGE: Vlan3 Grp 3 state Standby -> Active
*Apr 14, 12:17:26.1717: %HSRP-6-STATECHANGE: Vlan2 Grp 2 state Standby -> Active
*Apr 14, 12:17:27.1717: %HSRP-6-STATECHANGE: Vlan6 Grp 6 state Standby -> Active
```



VLANs	
2 RND	.64/27
3 Marketing	.96/27
4 Operation	.128/27
5 IT	.160/2
6 HR	.192/2
7 Wireless	.224/27
8 VOIP	32 /27



IOS Command Line Interface

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 10.0.0.10 to network 0.0.0.0

C 10.0.0.0/8 is directly connected, Vlan10
20.0.0.0/30 is subnetted, 1 subnets
O 20.0.0.0 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
192.168.0.0/24 is variably subnetted, 8 subnets, 2 masks
O 192.168.0.0/30 [110/2] via 10.0.0.2, 01:42:33, Vlan10
O 192.168.0.4/30 [110/2] via 10.0.0.1, 00:00:00, Vlan10
O 192.168.0.64/27 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
O 192.168.0.96/27 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
O 192.168.0.128/27 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
O 192.168.0.160/27 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
O 192.168.0.192/27 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
O 192.168.0.224/27 [110/3] via 10.0.0.2, 00:00:00, Vlan10
[110/3] via 10.0.0.1, 00:00:00, Vlan10
192.168.1.0/27 is subnetted, 6 subnets
C 192.168.1.64 is directly connected, Vlan2
C 192.168.1.96 is directly connected, Vlan3
C 192.168.1.128 is directly connected, Vlan4
C 192.168.1.160 is directly connected, Vlan5
C 192.168.1.192 is directly connected, Vlan6
C 192.168.1.224 is directly connected, Vlan7
S* 0.0.0.0/0 [1/0] via 10.0.0.10

B2_MS0

Physical Config **CLI** Attributes

IOS Command Line Interface

E1 - OSPF external type 1, E2 - OSPF external type 2,
EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
IS inter area
* - candidate default, U - per-user static route, o -
P - periodic downloaded static route

Gateway of last resort is 10.0.0.10 to network 0.0.0.0

```

C 10.0.0.0/8 is directly connected, Vlan10
O 20.0.0.0/30 is subnetted, 1 subnets
O     20.0.0.0 [110/3] via 10.0.0.1, 00:00:26, Vlan10
O 192.168.0.0/24 is variably subnetted, 8 subnets, 2 masks
O     192.168.0.0/30 [110/4] via 10.0.0.1, 00:00:26, Vlan10
O     192.168.0.4/30 [110/2] via 10.0.0.1, 00:00:26, Vlan10
O     192.168.0.64/27 [110/3] via 10.0.0.1, 00:00:26, Vlan1
O     192.168.0.96/27 [110/3] via 10.0.0.1, 00:00:26, Vlan1
O     192.168.0.128/27 [110/3] via 10.0.0.1, 00:00:26, Vlan1
O     192.168.0.160/27 [110/3] via 10.0.0.1, 00:00:26, Vlan1
O     192.168.0.192/27 [110/3] via 10.0.0.1, 00:00:26, Vlan1
O     192.168.0.224/27 [110/3] via 10.0.0.1, 00:00:26, Vlan1
O 192.168.1.0/27 is subnetted, 6 subnets
C     192.168.1.64 is directly connected, Vlan2
C     192.168.1.96 is directly connected, Vlan3
C     192.168.1.128 is directly connected, Vlan4
C     192.168.1.160 is directly connected, Vlan5
C     192.168.1.192 is directly connected, Vlan6
C     192.168.1.224 is directly connected, Vlan7
S* 0.0.0.0/0 [1/0] via 10.0.0.10

```

B2_MS0

Physical Config **CLI** Attributes

*Apr 14, 13:08:09.089: %LINEPROTO-5-UPDOWN: Line protocol on I:

B2_MS0#
B2_MS0#
B2_MS0#
B2_MS0#
B2_MS0#sh ip rout
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
E1 - OSPF external type 1, E2 - OSPF external type 2, E
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
* - candidate default, U - per-user static route, o - OI
P - periodic downloaded static route

Gateway of last resort is 10.0.0.10 to network 0.0.0.0

```

C 10.0.0.0/8 is directly connected, Vlan10
O 20.0.0.0/30 is subnetted, 1 subnets
O     20.0.0.0 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O 192.168.0.0/24 is variably subnetted, 8 subnets, 2 masks
O     192.168.0.0/30 [110/2] via 10.0.0.2, 01:43:08, Vlan10
O     192.168.0.4/30 [110/4] via 10.0.0.2, 00:00:05, Vlan10
O     192.168.0.64/27 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O     192.168.0.96/27 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O     192.168.0.128/27 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O     192.168.0.160/27 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O     192.168.0.192/27 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O     192.168.0.224/27 [110/3] via 10.0.0.2, 00:00:05, Vlan10
O 192.168.1.0/27 is subnetted, 6 subnets
C     192.168.1.64 is directly connected, Vlan2
C     192.168.1.96 is directly connected, Vlan3
C     192.168.1.128 is directly connected, Vlan4
C     192.168.1.160 is directly connected, Vlan5
C     192.168.1.192 is directly connected, Vlan6
C     192.168.1.224 is directly connected, Vlan7
S* 0.0.0.0/0 [1/0] via 10.0.0.10

```

B1_B_R0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
B1_B_R0>en
B1_B_R0#sh cry
B1_B_R0#sh crypto isa
B1_B_R0#sh crypto isakmp sa
IPv4 Crypto ISAKMP SA
dst          src          state      conn-id slot
status
30.0.0.1    12.0.0.1    QM_IDLE   1055      0
ACTIVE

40.0.0.1    12.0.0.1    QM_IDLE   1078      0
ACTIVE
```

B1_A_R0

```
B1_A_R0#sh crypto isakmp sa
IPv4 Crypto ISAKMP SA
dst          src          state      conn-id slot
status
30.0.0.1    11.0.0.1    QM_IDLE   1022      0
ACTIVE

40.0.0.1    11.0.0.1    QM_IDLE   1078      0
ACTIVE

IPv6 Crypto ISAKMP SA
```

B4_R0

```
B4_R0>en
B4_R0#sh crypto
B4_R0#sh crypto isa
B4_R0#sh crypto isakmp sa
IPv4 Crypto ISAKMP SA
dst          src          state
status
11.0.0.1    40.0.0.1    QM_IDLE
ACTIVE
```

B3_R0

```
B3_R0#sh crypto is
B3_R0#sh crypto isakmp sa
IPv4 Crypto ISAKMP SA
dst          src          state
status
11.0.0.1    30.0.0.1    QM_IDLE
ACTIVE
```

```
IPv6 Crypto ISAKMP SA
```

B1_B_IT_SV

Physical Config Services Desktop Programming Attributes

SERVICES

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

Syslog

Syslog

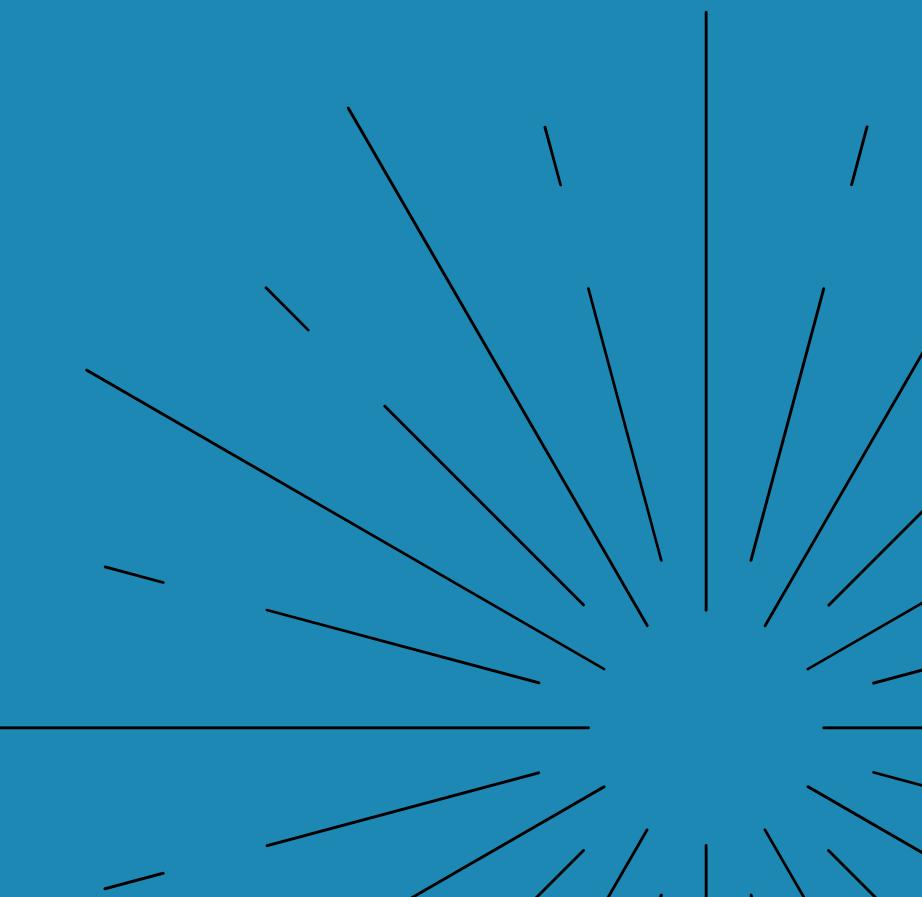
Service

On Off

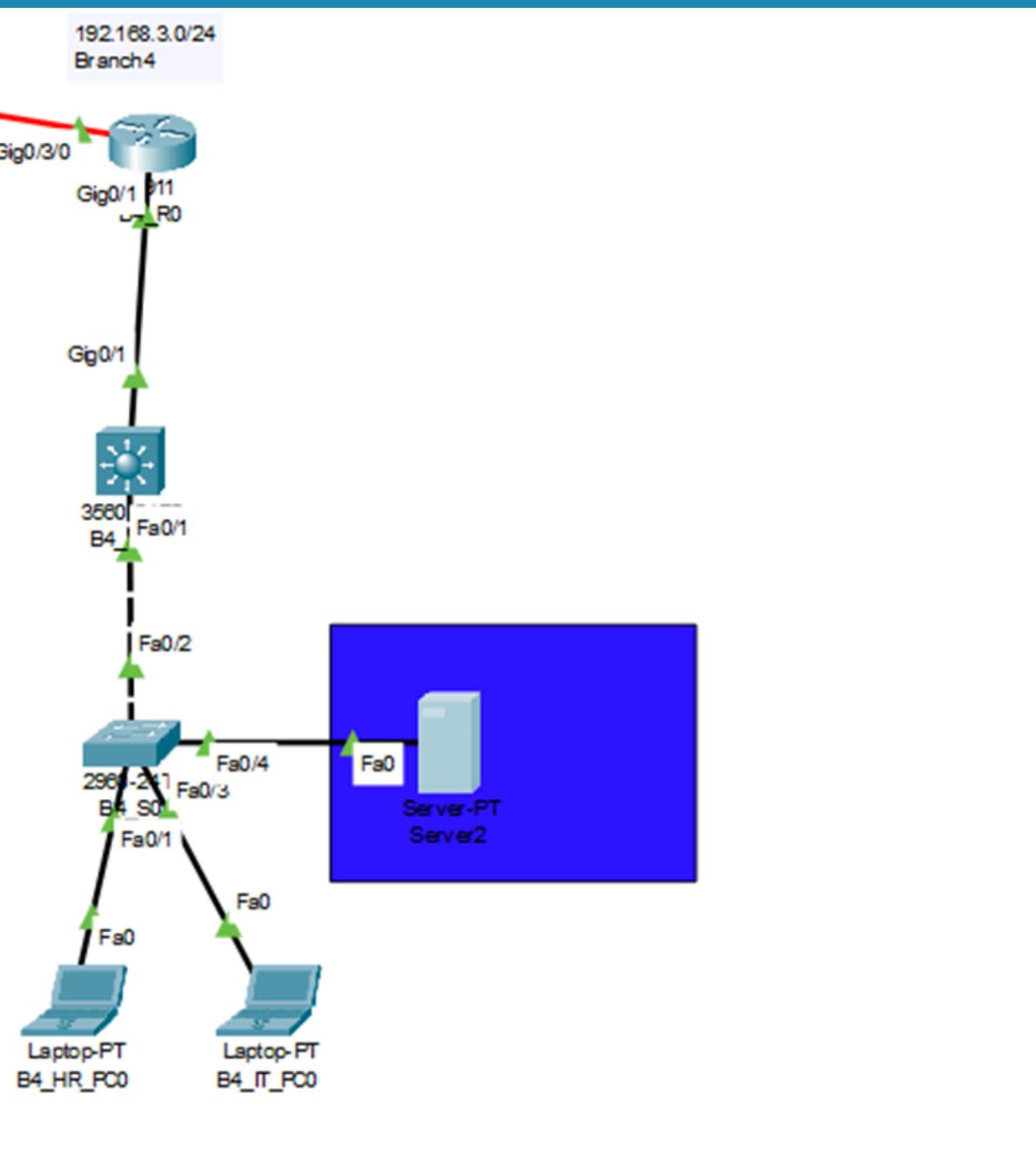
	Time	HostName	Message
1	04.13.2025 05:52:08.771 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan4 Grp 4 state ...
2	04.13.2025 05:52:08.771 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan4 Grp 4 state ...
3	04.13.2025 05:52:08.774 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan5 Grp 5 state ...
4	04.13.2025 05:52:08.779 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan5 Grp 5 state ...
5	04.13.2025 05:52:08.805 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan6 Grp 6 state ...
6	04.13.2025 05:52:08.805 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan6 Grp 6 state ...
7	04.13.2025 05:52:08.877 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan7 Grp 7 state ...
8	04.13.2025 05:52:08.877 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan7 Grp 7 state ...
9	04.13.2025 05:41:09.942 AM	192.168.0.163	%HSRP-6-STATECHANGE: Vlan4 Grp 4 state ...
10	04.13.2025 05:41:09.972 AM	192.168.0.163	%HSRP-6-STATECHANGE: Vlan6 Grp 6 state ...
11	04.13.2025 05:41:09.990 AM	192.168.0.163	%HSRP-6-STATECHANGE: Vlan7 Grp 7 state ...
12	04.13.2025 05:41:10.023 AM	192.168.0.163	%HSRP-6-STATECHANGE: Vlan5 Grp 5 state ...
13	04.13.2025 05:52:09.083 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan3 Grp 3 state ...
14	04.13.2025 05:52:09.083 AM	192.168.0.162	%HSRP-6-STATECHANGE: Vlan3 Grp 3 state ...
15	04.13.2025 05:41:12.752 AM	192.168.0.163	%HSRP-6-STATECHANGE: Vlan3 Grp 3 state ...
40	04.13.2025 05:41:10.040 AM	192.168.0.163	

SNMP

-Each server in each branch is the snmp manager and the rest of the devices are considered snmp agents, as shown in the figure.

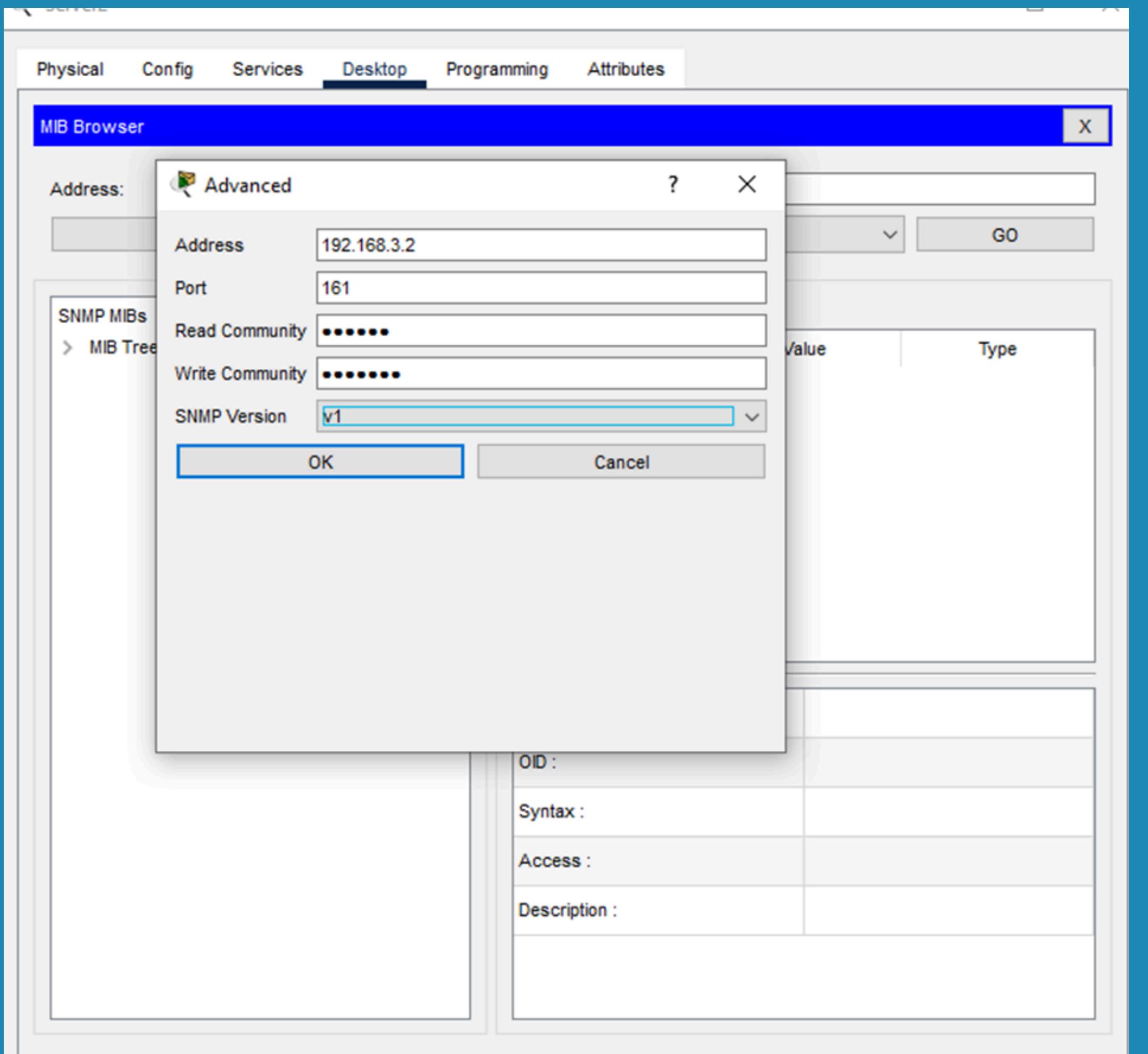


SNMP



SNMP

- Open mib browser and Write ip , read ,wire community and select versions then connect to router or switch .
- Here is an example of connecting to the router on the other branch and we notice that we can use get and set.



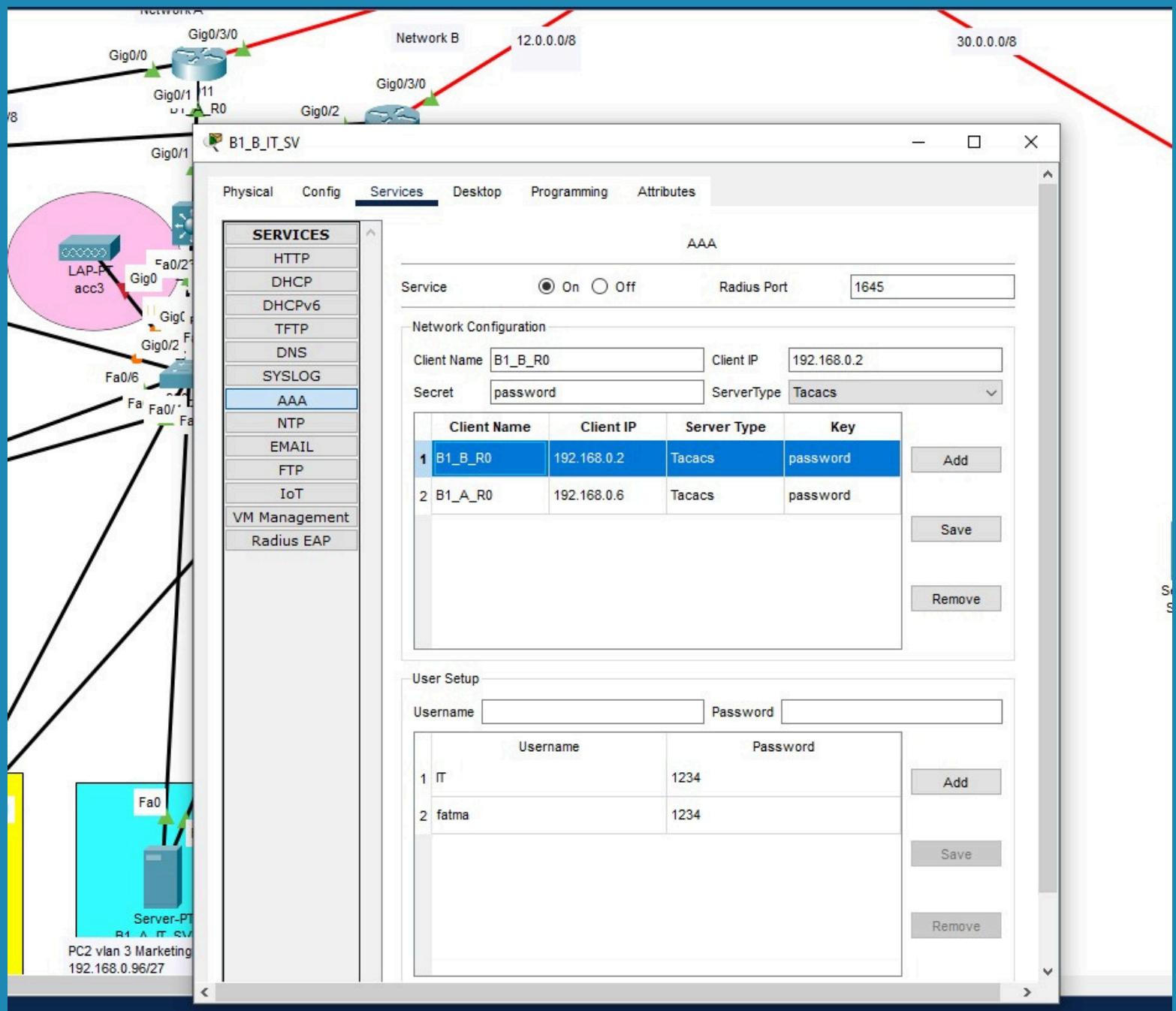
The screenshot shows the MIB Browser interface with the following details:

- Address:** 192.168.3.2
- OID:** 1.3.6.1.2.1.1.5.0
- Operations:** Get
- Result Table:** A table showing the value of the sysName MIB object.
- MIB Tree (Left Panel):**
 - MIB Tree
 - router_adv MIBs
 - .iso
 - .mif
 - .dod
 - .internet
 - .mib-2
 - .system
 - sysDescr
 - sysObjectID
 - sysUpTime
 - sysContact
 - sysName**
 - sysLocation
 - .interfaces
 - .ip
 - .ospf
 - .rp2
 - .private
 - router_advip MIBs
 - switch_L2 MIBs
 - switch_multilayer MIBs
 - Properties (Bottom Panel):**

Name:	sysName
OID:	1.3.6.1.2.1.1.5.0
Syntax:	
Access:	
Description:	

AAA server

**-In each branch we activated
AAA server at each router.**



The screenshot shows a terminal window displaying a user session on a router.

Router Configuration: The router has multiple interfaces and network configurations. A red arrow points from the "30.0.0.0/8" network entry in the first screenshot to the "30.0.0.0/8" network entry in the second screenshot.

Terminal Session (CLI Tab):

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
%HSRP-6-STATECHANGE: GigabitEthernet0/2 Grp 1 state Speak -> Standby
03:39:43: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.225 on GigabitEthernet0/2 from LOADING to FULL, Loading Done
03:39:43: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.0.6 on GigabitEthernet0/2 from LOADING to FULL, Loading Done
03:39:48: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.0.1 on GigabitEthernet0/1 from LOADING to FULL, Loading Done

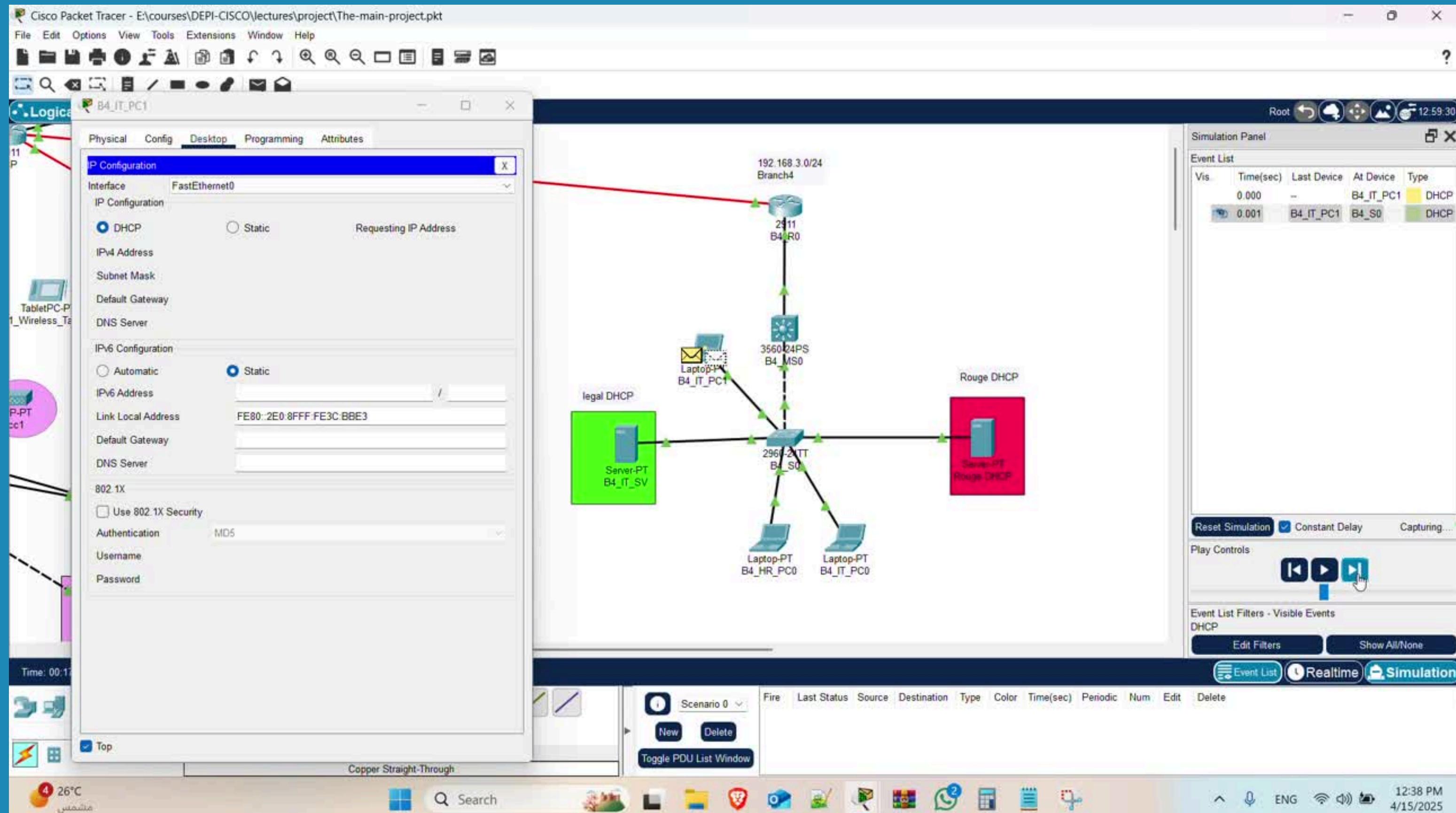
User Access Verification

Username: IT
Password: B1_B_R0>
```

A red box highlights the "User Access Verification" section, and another red box highlights the password entry "B1_B_R0>".

DHCP SNOOPING

```
B4_S0#sh ip dhcp sn
B4_S0#sh ip dhcp snooping
Switch DHCP snooping is enabled
DHCP snooping is configured on following VLANs:
1-7
Insertion of option 82 is enabled
Option 82 on untrusted port is not allowed
Verification of hwaddr field is enabled
Interface          Trusted    Rate limit (pps)
-----
FastEthernet0/4      yes       unlimited
FastEthernet0/3      no        6
FastEthernet0/1      no        6
FastEthernet0/6      no        6
FastEthernet0/5      no        6
B4_S0#
```

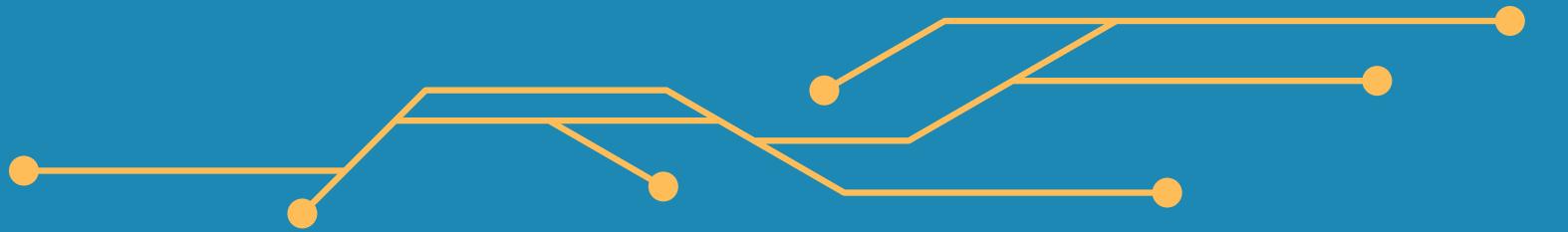
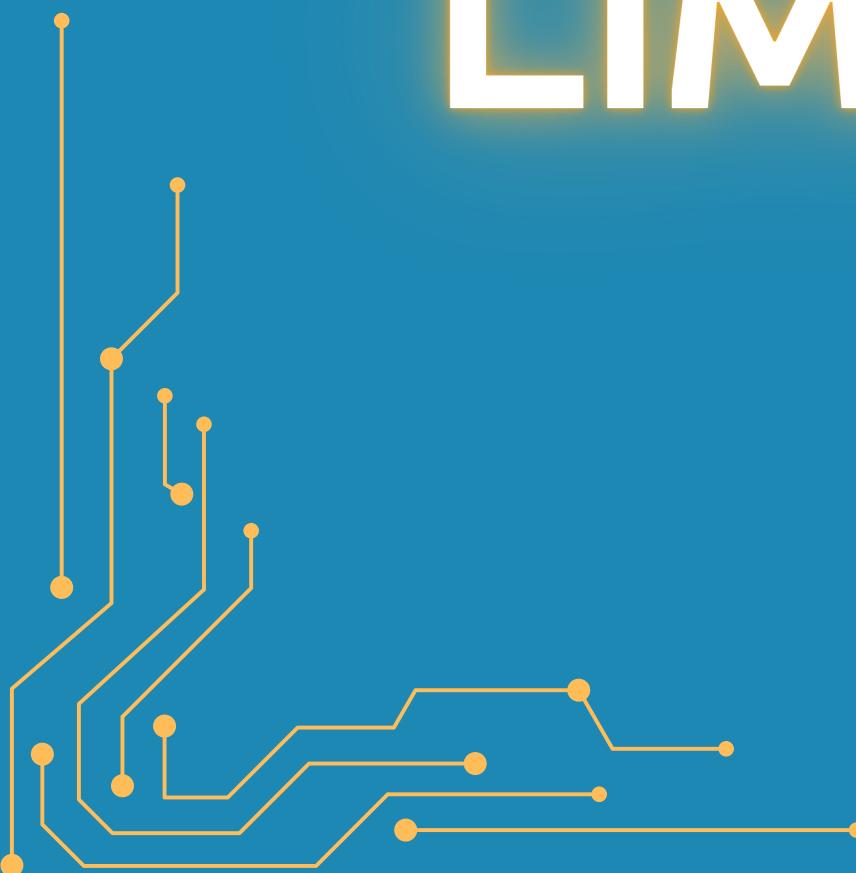


Search

12:38 PM
4/15/2025



PACKET TRACER LIMITATIONS

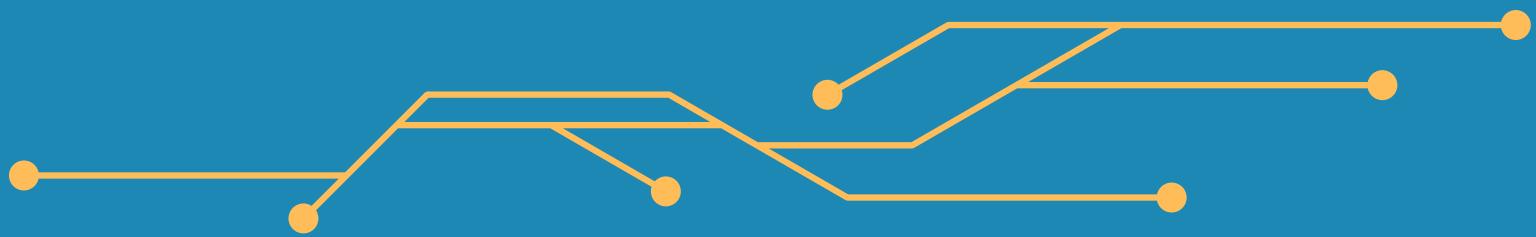
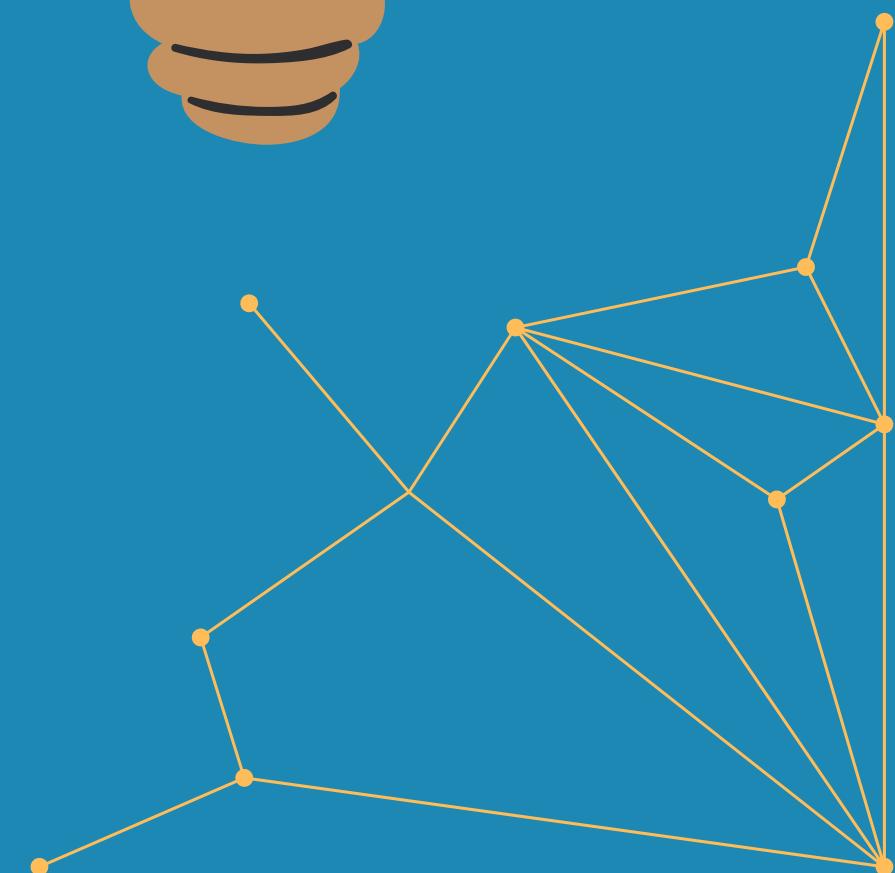
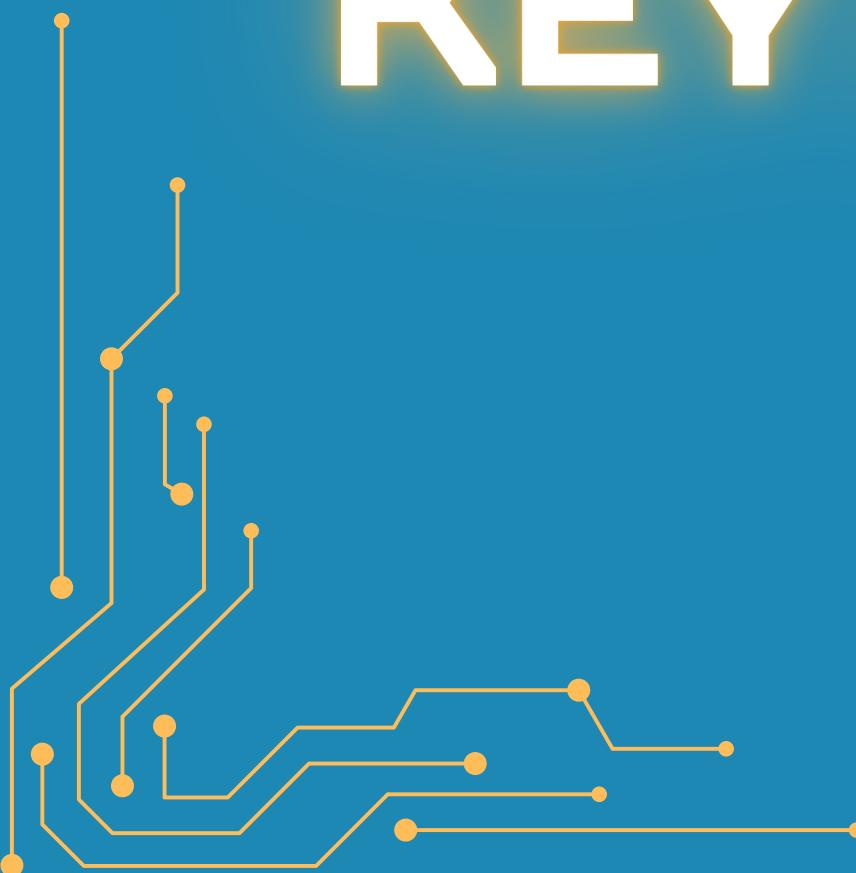


PACKET TRACER LIMITATIONS:

- 1- End devices are restricted to a single interface.**
- 2- NIC teaming functionality is unavailable.**
- 3- Link-state tracking is not supported.**
- 4- GRE interfaces do not support the crypto IPsec profile command.**

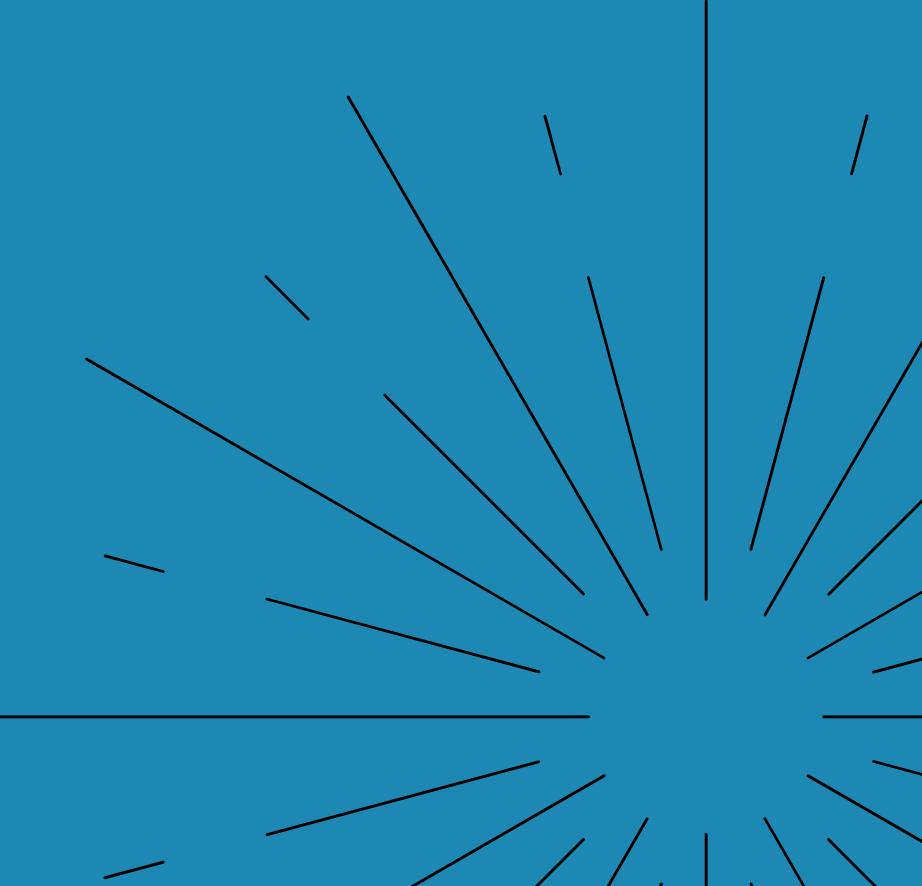


KEY LEARNINGS

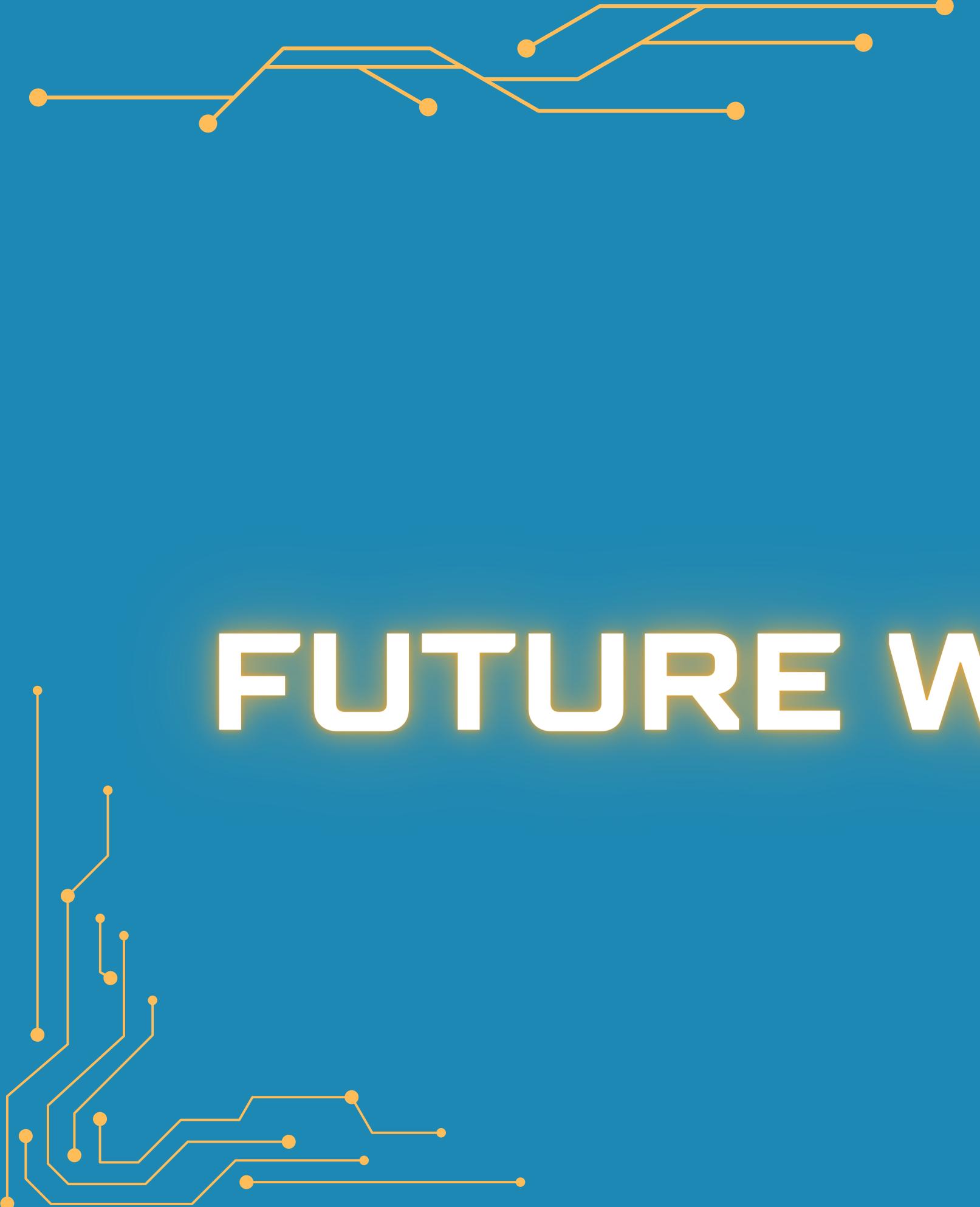


KEY LEARNINGS FROM THE PROJECT

- 1. Bridging Theory and Practice**
- 2. Security is Multi-Layered**
- 3. The Power of Verification**
- 4-Using collaboration tools improved our productivity**

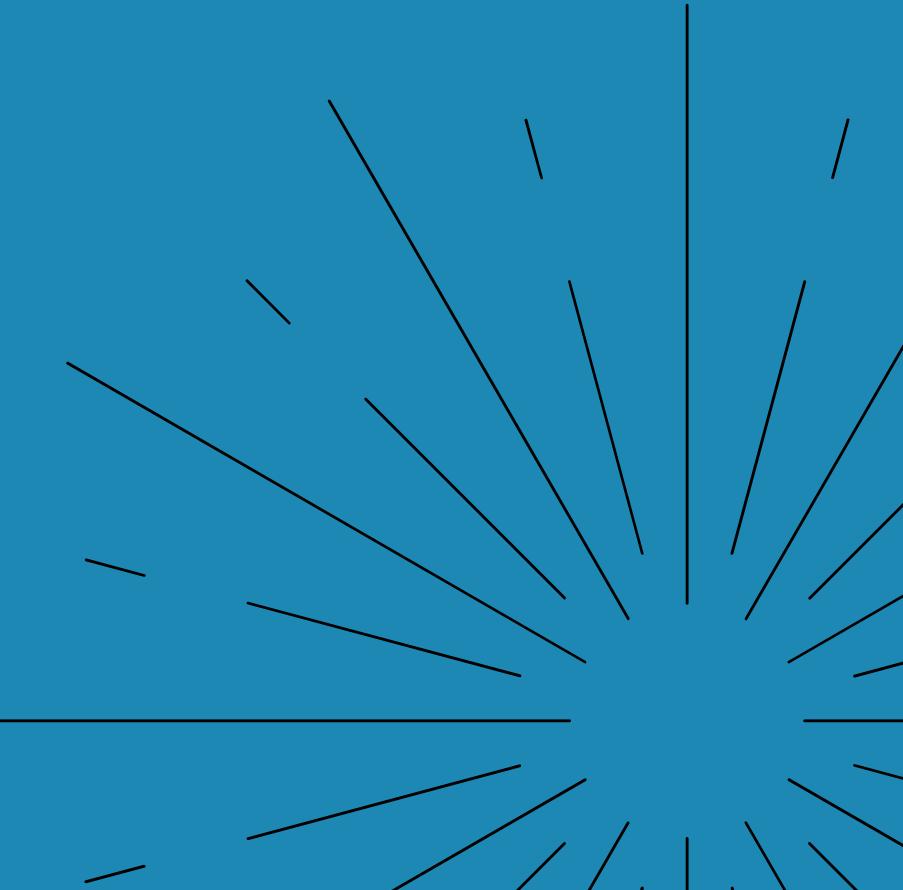


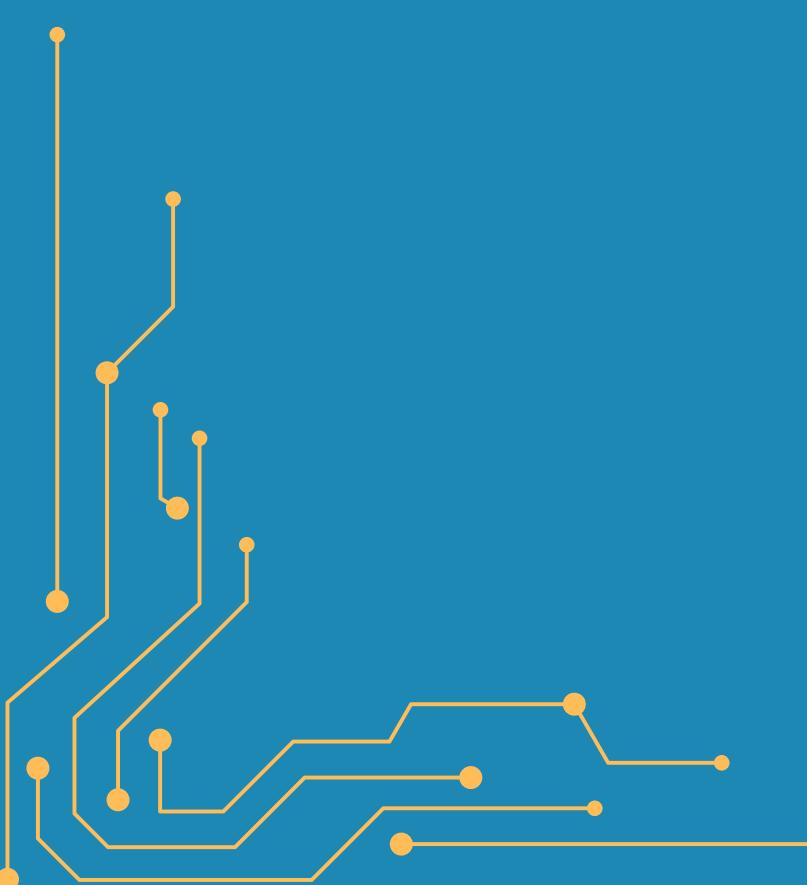
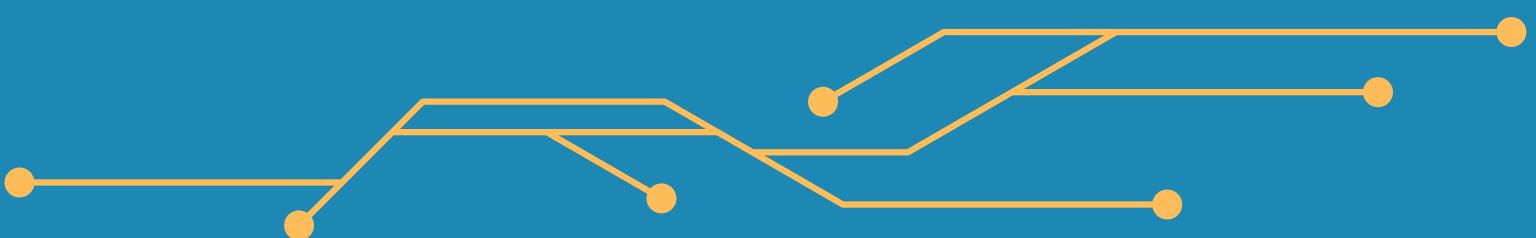
FUTURE WORK



FUTURE WORK

- Inter-Branch VoIP Deployment
- Integrate Wi-Fi into the Management Network





Thank you for your attention
and support throughout this
project.