PROJETO DE REDES CONVERGENTES

Universidade de Fortaleza
Curso: Ciência da Computação
Disciplina: Redes Convergentes
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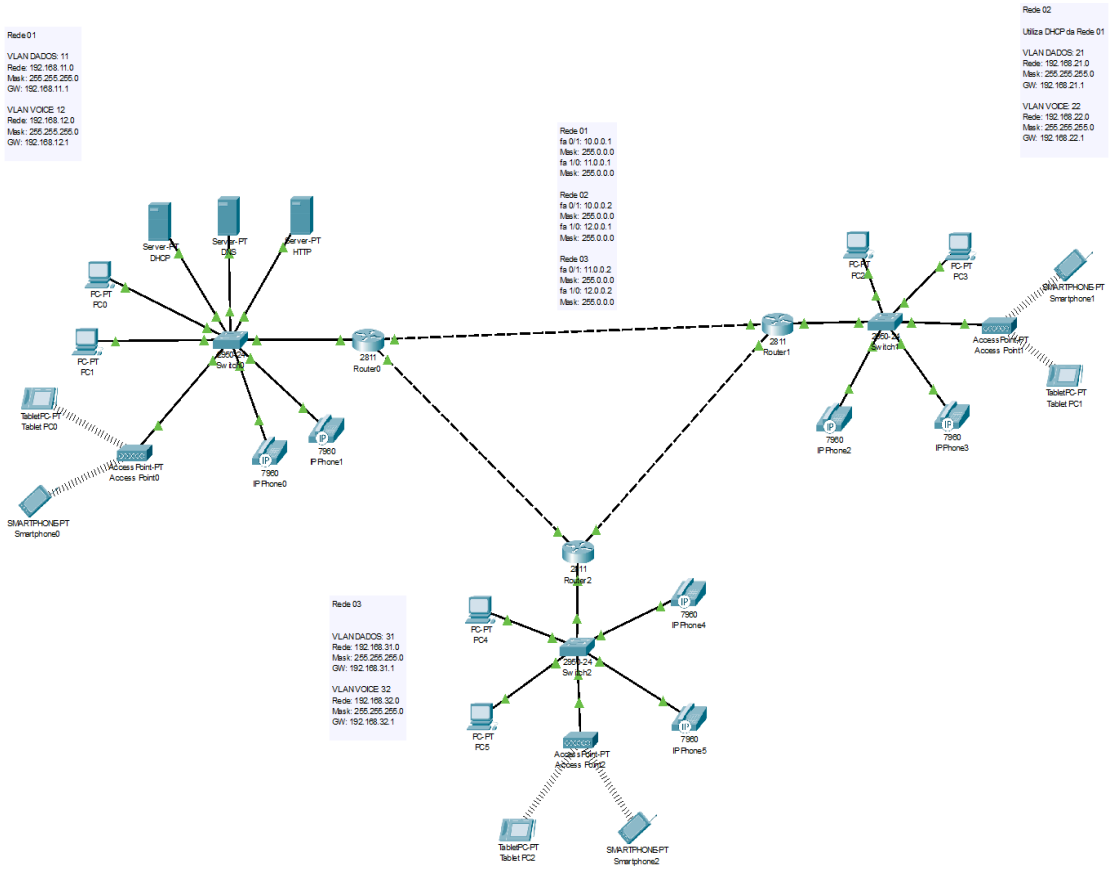
Introdução

Este projeto visa demonstrar a aplicação prática dos conceitos teóricos abordados na disciplina de Projeto de Redes Convergentes, utilizando o software Packet Tracer para simular uma rede com protocolos e tecnologias convergentes. O objetivo é criar uma rede funcional que suporte comunicação de dados e voz entre dispositivos conectados em VLANs distintas e que possam acessar serviços como DHCP, DNS e HTTP. O projeto aborda técnicas de endereçamento IP, tanto estático quanto dinâmico via DHCP. Utilizamos servidores DNS, tanto internos quanto externos, para a tradução de nomes de domínio em endereços IP. As LANs virtuais (VLANs) foram implementadas para a segmentação e isolamento das redes em ambientes distintos. Para o roteamento das solicitações entre esses segmentos, adotamos o protocolo RIP.

Metodologia

O projeto foi dividido em duas partes principais, a configuração no Packet Tracer e a elaboração deste relatório. Na prática, utilizamos três redes distintas configuradas com diferentes VLANs para dados e voz, e implementamos servidores DHCP, DNS e HTTP. Todos os dispositivos foram configurados para se comunicarem utilizando protocolos de rede adequados. Todos os dispositivos foram configurados para se comunicarem utilizando protocolos de rede adequados. Além disso, realizamos a simulação de cenários de falha e testes de segurança para garantir a robustez da rede. Configurações adicionais de QoS foram aplicadas para priorizar o tráfego de voz sobre o de dados, assegurando a qualidade das comunicações VoIP.



Rede 1

VLAN de Dados (VLAN 11)

- **Rede: 192.168.11.0**
- **Máscara de Sub-rede: 255.255.255.0**
- **Gateway Padrão (IP estático do Router): 192.168.11.1**
- **Endereço de Broadcast: 192.168.11.255**
- **Servidor DHCP (IP estático): 192.168.11.2**
- **Servidor DNS (IP estático): 192.168.11.3**
- **Servidor HTTP (IP estático): 192.168.11.4**
- **Range de DHCP para dispositivos: 192.168.11.5 - 192.168.11.254**

VLAN de Voz (VLAN 12)

- **Rede: 192.168.12.0**
- **Máscara de Sub-rede: 255.255.255.0**
- **Gateway Padrão (IP estático do Router): 192.168.12.1**
- **Endereço de Broadcast: 192.168.12.255**
- **DHCP Servido pelo Servidor na VLAN 11 (IP estático): 192.168.11.2**
- **Range de DHCP para dispositivos de voz: 192.168.12.5 - 192.168.12.254**

Rede 2

VLAN de Dados (VLAN 21)

- **Rede: 192.168.21.0**
- **Máscara de Sub-rede: 255.255.255.0**
- **Gateway Padrão (IP estático do Router): 192.168.21.1**
- **Endereço de Broadcast: 192.168.21.255**
- **Servidor DHCP (IP estático): Configurado para servir endereços de 192.168.21.5 até 192.168.21.254**
- **Range de DHCP para dispositivos: 192.168.21.5 - 192.168.21.254**

VLAN de Voz (VLAN 22)

- **Rede: 192.168.22.0**
- **Máscara de Sub-rede: 255.255.255.0**
- **Gateway Padrão (IP estático do Router): 192.168.22.1**
- **Endereço de Broadcast: 192.168.22.255**
- **DHCP Servido pelo Servidor na VLAN 21 (IP estático): 192.168.21.2 (assumindo um cenário semelhante à Rede 1)**
- **Range de DHCP para dispositivos de voz: 192.168.22.5 - 192.168.22.254**

Rede 3

VLAN de Dados (VLAN 31)

- **Rede: 192.168.31.0**
- **Máscara de Sub-rede: 255.255.255.0**
- **Gateway Padrão (IP estático do Router): 192.168.31.1**
- **Endereço de Broadcast: 192.168.31.255**
- **Servidor DHCP (IP estático): Ainda não especificado, mas um exemplo seria 192.168.31.2**
- **Range de DHCP para dispositivos: 192.168.31.5 - 192.168.31.254**

VLAN de Voz (VLAN 32)

- **Rede: 192.168.32.0**
- **Máscara de Sub-rede: 255.255.255.0**
- **Gateway Padrão (IP estático do Router): 192.168.32.1**
- **Endereço de Broadcast: 192.168.32.255**

- **DHCP Servido pelo Servidor na VLAN 31 (IP estático): 192.168.31.2 (assumindo um cenário semelhante à Rede 1 e 2)**
- **Range de DHCP para dispositivos de voz: 192.168.32.5 - 192.168.32.254**

Source Code,

REDE 01:

VLAN DADOS: 11

Rede: 192.168.11.0

Mask: 255.255.255.0

Gateway: 192.168.11.1

Broadcast: 192.168.11.255

Broadcast Voz: 192.168.12.255

Servidor DHCP: 192.168.11.2 (Estático)

Servidor DNS: 192.168.11.3 (Estático)

Servidor HTTP: 192.168.11.4 (Estático)

Range DHCP: 192.168.11.5 - 192.168.11.254

Range DHCP Voz: 192.168.12.5 - 192.168.12.254

VLAN VOICE: 12

Rede: 192.168.12.0

Mask: 255.255.255.0

Gateway: 192.168.12.1

DHCP: 192.168.11.2

Switch Rede 01

Switch>en

Switch#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#vlan 11

Switch(config-vlan)#name dados

Switch(config-vlan)#exit

Switch(config)#vlan 12

Switch(config-vlan)#name voice

Switch(config-vlan)#exit

Switch(config)#int fa 0/1

Switch(config-if)#switchport mode trunk

Switch(config-if)#exit

Switch(config)#int range fa 0/2-24

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 11

Switch(config-if-range)#exit

Switch(config)#int range fa 0/23-24

Switch(config-if-range)#switchport voice vlan 12

Switch(config-if-range)#exit

Switch(config)#exit

Switch#

Router Rede 01

INTERFACES:

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa 0/0

Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Router(config-if)#exit

Router(config)#int fa 0/1

Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Router(config-if)#ip address 10.0.0.1 255.0.0.0

Router(config-if)#exit

Router(config)#int fa 1/0

Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

Router(config-if)#ip address 11.0.0.1 255.0.0.0

Router(config-if)#exit

Router(config)#int fastEthernet 0/0.11

%LINK-5-CHANGED: Interface FastEthernet0/0.11, changed state to up

Router(config-subif)#ip add

Router(config-subif)#encapsulation dot1Q 11

Router(config-subif)#ip address 192.168.11.1 255.255.255.0

Router(config-subif)#exit

Router(config)#int fastEthernet 0/0.12

%LINK-5-CHANGED: Interface FastEthernet0/0.12, changed state to up

Router(config-subif)#encapsulation dot1Q 12

Router(config-subif)#ip address 192.168.12.1 255.255.255.0

Router(config-subif)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Building configuration...

[OK]

TELEFONIA:

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fastEthernet 0/0.12

Router(config-subif)#ip helper-address 192.168.11.2

Router(config-subif)#exit

Router(config)#telephony-service

Router(config-telephony)#max-dn 10

Router(config-telephony)#max-ephones 10

Router(config-telephony)#ip source-address 192.168.12.1 port 2000

Router(config-telephony)#auto assign 1 to 10

Router(config-telephony)#exit

Router(config)#ephone-dn 1

Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 100

Router(config-ephone-dn)#exit

Router(config)#ephone-dn 2

Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 101

%IPPHONE-6-REGISTER: ephone-1 IP:192.168.12.6 Socket:2 DeviceType:Phone has registered.

%IPPHONE-6-REGISTER: ephone-2 IP:192.168.12.8 Socket:2 DeviceType:Phone has registered.

Router(config-ephone-dn)#exit

Router(config)#end

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#

Building configuration...

[OK]

Router#

ROTAS:

Router>en

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#router rip

Router(config-router)#network 192.168.11.0

Router(config-router)#network 192.168.12.0

Router(config-router)#network 10.0.0.0

Router(config-router)#network 11.0.0.0

Router(config-router)#end

Router#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router#

ROTAS VOIP:

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#dial-peer voice 1 voip

Router(config-dial-peer)#destination-pattern 300

Router(config-dial-peer)#session target ipv4:11.0.0.2

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 2 voip

Router(config-dial-peer)#destination-pattern 301

Router(config-dial-peer)#session target ipv4:11.0.0.2

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 3 voip

Router(config-dial-peer)#destination-pattern 200

Router(config-dial-peer)#session target ipv4:10.0.0.2

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 4 voip

Router(config-dial-peer)#destination-pattern 201

Router(config-dial-peer)#session target ipv4:10.0.0.2

Router(config-dial-peer)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router#

REDE 02:

VLAN DADOS: 21

Rede: 192.168.21.0

Mask: 255.255.255.0

Gateway: 192.168.21.1

Broadcast: 192.168.21.255

Broadcast Voz: 192.168.22.255

Range DHCP: 192.168.21.5 - 192.168.21.254

Range DHCP Voz: 192.168.22.5 - 192.168.22.254

Servidor DHCP: 192.168.11.2 - Rede 01

VLAN VOICE: 22

Rede: 192.168.22.0

Mask: 255.255.255.0

Gateway: 192.168.22.1

DHCP: 192.168.21.2

Switch Rede 02:

Switch>en

Switch#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#vlan 21

Switch(config-vlan)#name dados

Switch(config-vlan)#exit

Switch(config)#vlan 22

Switch(config-vlan)#name voice

Switch(config-vlan)#exit

Switch(config)#int fa 0/1

Switch(config-if)#switchport mode trunk

Switch(config-if)#exit

Switch(config)#int range fa 0/2-24

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 21

Switch(config-if-range)#exit

Switch(config)#int range fa 0/23-24

Switch(config-if-range)#switchport voice vlan 22

Switch(config-if-range)#exit

Switch(config)#exit

Switch#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router Rede 02:

INTERFACES:

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa 0/0

Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Router(config-if)#exit

Router(config)#int fa 0/1

Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Router(config-if)#ip address 10.0.0.2 255.0.0.0

Router(config-if)#exit

Router(config)#int fa 1/0

Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

Router(config-if)#ip address 12.0.0.1 255.0.0.0

Router(config-if)#exit

Router(config)#int fastEthernet 0/0.21

%LINK-5-CHANGED: Interface FastEthernet0/0.21, changed state to up

Router(config-subif)#ip add

Router(config-subif)#encapsulation dot1Q 21

Router(config-subif)#ip address 192.168.21.1 255.255.255.0

Router(config-subif)#ip helper-address 192.168.11.2

Router(config-subif)#exit

Router(config)#int fastEthernet 0/0.22

%LINK-5-CHANGED: Interface FastEthernet0/0.22, changed state to up

Router(config-subif)#encapsulation dot1Q 22

Router(config-subif)#ip address 192.168.22.1 255.255.255.0

Router(config-subif)#ip helper-address 192.168.11.2

Router(config-subif)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Building configuration...

[OK]

TELEFONIA:

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#telephony-service

Router(config-telephony)#max-dn 10

Router(config-telephony)#max-ephones 10

Router(config-telephony)#ip source-address 192.168.22.1 port 2000

Router(config-telephony)#auto assign 1 to 10

Router(config-telephony)#exit

Router(config)#ephone-dn 1

Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 200

Router(config-ephone-dn)#exit

Router(config)#ephone-dn 2

Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 201

%IPPHONE-6-REGISTER: ephone-1 IP:192.168.22.6 Socket:2 DeviceType:Phone has registered.

%IPPHONE-6-REGISTER: ephone-2 IP:192.168.22.8 Socket:2 DeviceType:Phone has registered.

Router(config-ephone-dn)#exit

Router(config)#end

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#

Building configuration...

[OK]

Router#

ROTAS:

Router>en

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#router rip

Router(config-router)#network 192.168.21.0

Router(config-router)#network 192.168.22.0

Router(config-router)#network 10.0.0.0

Router(config-router)#network 12.0.0.0

Router(config-router)#end

Router#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router#

ROTAS VOIP:

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#dial-peer voice 1 voip

Router(config-dial-peer)#destination-pattern 300

Router(config-dial-peer)#session target ipv4:12.0.0.2

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 2 voip

Router(config-dial-peer)#destination-pattern 301

Router(config-dial-peer)#session target ipv4:12.0.0.2

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 3 voip

Router(config-dial-peer)#destination-pattern 100

Router(config-dial-peer)#session target ipv4:10.0.0.1

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 4 voip

Router(config-dial-peer)#destination-pattern 101

Router(config-dial-peer)#session target ipv4:10.0.0.1

Router(config-dial-peer)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router#

REDE 03:

VLAN DADOS: 31

Rede: 192.168.31.0

Mask: 255.255.255.0

Gateway: 192.168.31.1

Broadcast: 192.168.31.255

Broadcast Voz: 192.168.32.255

DHCP: 192.168.31.1 - Roteador

VLAN VOICE: 32

Rede: 192.168.32.0

Mask: 255.255.255.0

Gateway: 192.168.32.1

DHCP: 192.168.31.1

Switch Rede 03:

Switch> en

Switch# conf t

> Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)# vlan 32

Switch(config-vlan)# name voice

Switch(config-vlan)# exit

Switch(config)# vlan 31

Switch(config-vlan)# name dados

Switch(config-vlan)# exit

Switch(config)# int fa 0/1

Switch(config-if)# switchport mode trunk

Switch(config-if-range)# exit

Switch(config)# int range fa 0/2-24

Switch(config-if-range)# switchport mode access

Switch(config-if-range)# switchport access vlan 31

Switch(config-if-range)# exit

Switch(config)# int range fa 0/23-24

Switch(config-if-range)# switchport voice vlan 32

Switch(config-if-range)# exit

Switch(config)# end

Switch#

> %SYS-5-CONFIG_I: Configured from console by console

> Building configuration...

> [OK]

Router Rede 03:

INTERFACES:

Router> en

Router# conf t

> Enter configuration commands, one per line. End with CNTL/Z.

Router(config)# int fa 0/0

Router(config-if)# no shutdown

> %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Router(config-if)# exit

Router(config)# int fa 0/1

Router(config-if)# no shutdown

> %LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Router(config-if)# ip address 11.0.0.2 255.0.0.0

Router(config-if)# exit

Router(config)# int fa 1/0

Router(config-if)# no shutdown

> %LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

Router(config-if)# ip address 12.0.0.2 255.0.0.0

Router(config-if)# exit

Router(config)# int fastEthernet 0/0.31

> %LINK-5-CHANGED: Interface FastEthernet0/0.31, changed state to up

Router(config-subif)# ip add

Router(config-subif)# encapsulation dot1Q 31

Router(config-subif)# ip address 192.168.31.1 255.255.255.0

Router(config-subif)# exit

Router(config)# int fastEthernet 0/0.12

> %LINK-5-CHANGED: Interface FastEthernet0/0.32, changed state to up

Router(config-subif)# encapsulation dot1Q 32

Router(config-subif)# ip address 192.168.32.1 255.255.255.0

Router(config-subif)# exit

DHCP:

Router(config)# ip dhcp pool dados

Router(dhcp-config)# network 192.168.31.0 255.255.255.0

Router(dhcp-config)# dns-server 192.168.11.3

Router(dhcp-config)# default-router 192.168.31.1

Router(dhcp-config)# exit

Router(config)# ip dhcp pool voice

Router(dhcp-config)# network 192.168.32.0 255.255.255.0

Router(dhcp-config)# default-router 192.168.32.1

Router(dhcp-config)# option 150 ip 192.168.32.1

Router(dhcp-config)# exit

Router(config)# exit

Router(config)# exit

Router#

> %SYS-5-CONFIG_I: Configured from console by console

> Building configuration...

> [OK]

TELEFONIA:

Router(config)# telephony-service

Router(config-telephony)# max-dn 10

Router(config-telephony)# max-ephones 10

Router(config-telephony)# ip source-address 192.168.32.1 port 2000

Router(config-telephony)# auto assign 1 to 10

Router(config-telephony)# exit

Router(config)# ephone-dn 1

Router(config-ephone-dn)# %LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)# number 300

Router(config-ephone-dn)# exit

Router(config)# ephone-dn 2

Router(config-ephone-dn)# %LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)# number 301

Router(config-ephone-dn)# exit

Router(config)# exit

ROTAS:

Router>en

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#router rip

Router(config-router)#network 192.168.31.0

Router(config-router)#network 192.168.32.0

Router(config-router)#network 11.0.0.0

Router(config-router)#network 12.0.0.0

Router(config-router)#end

Router#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router#

ROTAS VOIP:

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#dial-peer voice 1 voip

Router(config-dial-peer)#destination-pattern 100

Router(config-dial-peer)#session target ipv4:11.0.0.1

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 2 voip

Router(config-dial-peer)#destination-pattern 101

Router(config-dial-peer)#session target ipv4:11.0.0.1

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 3 voip

Router(config-dial-peer)#destination-pattern 200

Router(config-dial-peer)#session target ipv4:12.0.0.1

Router(config-dial-peer)#exit

Router(config)#dial-peer voice 4 voip

Router(config-dial-peer)#destination-pattern 201

Router(config-dial-peer)#session target ipv4:12.0.0.1

Router(config-dial-peer)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

w

Building configuration...

[OK]

Router#

Resultados

A simulação no Packet Tracer foi bem-sucedida, todos os casos de testes elaborados pelos autores deste projeto como o orientador do mesmo foram sucedidos, no qual todas as máquinas dentro de suas respectivas VLANs conseguindo comunicar-se e acessar os serviços de rede provisionados. As VLANs de voz e dados funcionaram conforme o planejado, e os dispositivos wireless também estavam operacionais.

Repositório:

https://github.com/ThiagoDev202/convergent-networks

Conclusão

Este projeto permitiu a aplicação prática de conceitos teóricos como VLAN, DHCP, DNS e roteamento inter-VLAN. A experiência reforçou a importância do planejamento e da configuração cuidadosa em ambientes de redes convergentes, mostrando a eficácia de uma rede bem configurada na suportação de múltiplos serviços e protocolos de comunicação. A implementação bem-sucedida deste projeto demonstra nossa compreensão das tecnologias de rede e sua aplicação prática.