Project Based Learning

Otávio Affonso Araújo A042508

Gonçalo Caridade Ribeiro A043540

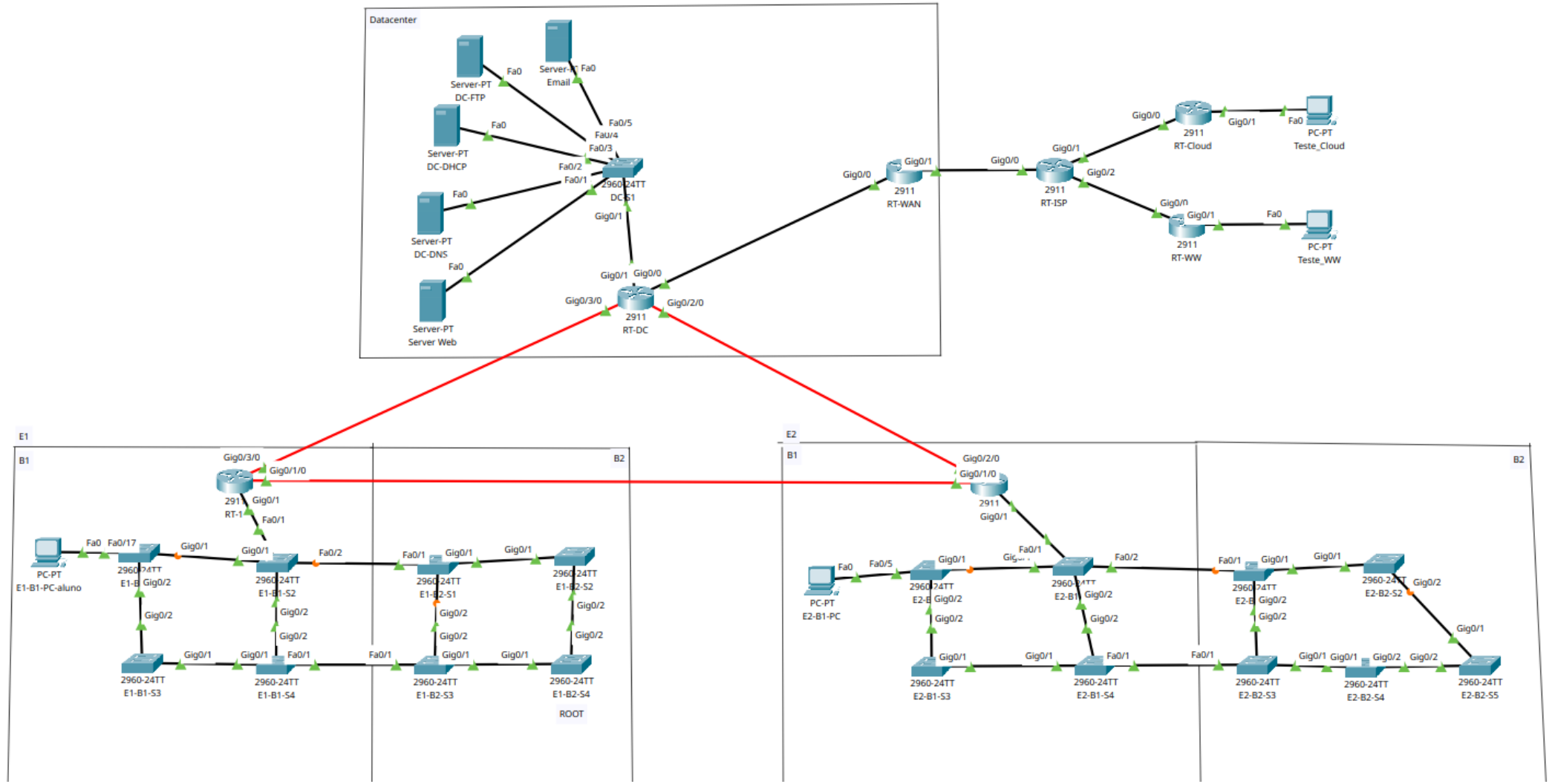
Introdução

Nosso objetivo foi propor uma implementação de uma arquitetura de rede e serviços de um campus da Universidade da Maia.

Para conseguir executar o subnetting, utilizamos a rede:
192.168.0.0/22

Senhas:
enable secret pblEN2024
line console 0 password pblCON2024!
line vty 0 15 password pblEN2024!

Topologia


Datacenter
Server-PT DC-FTP
Server-PT Email
Server-PT DC-DHCP
Server-PT DC-DNS
Server-PT Server Web
2960-24TT DC-S1
2911 RT-DC
2911 RT-WAN
2911 RT-ISP
2911 RT-Cloud
2911 RT-WW
PC-PT Teste_Cloud
PC-PT Teste_WW
E1
B1
B2
2911 RT-1
PC-PT E1-B1-PC-aluno
2960-24TT E1-B1-S1
2960-24TT E1-B1-S2
2960-24TT E1-B2-S1
2960-24TT E1-B2-S2
2960-24TT E1-B1-S3
2960-24TT E1-B1-S4
2960-24TT E1-B2-S3
2960-24TT E1-B2-S4
ROOT
E2
B1
B2
2911
PC-PT E2-B1-PC
2960-24TT E2-B1-S3
2960-24TT E2-B1-S4
2960-24TT E2-B2-S3
2960-24TT E2-B2-S4
2960-24TT E2-B2-S5

VLANs

- Alunos (Vlan 10)
- Professores (Vlan 20)
- Concelho De Gest. (Vlan 30)
- Informática (Vlan 40)
- Serv. Académicos (Vlan 50)
- Gest. Rede (Vlan 60)
- Telefone (Vlan 70)
- Convidados (Vlan 80)
- CCTV (Vlan 90)
- Impressora (Vlan 100)
- TV (Vlan 110)
- AVAC (Vlan 120)
- Serv. Internos (Vlan 130)
- **Native** (Vlan 947)

VLANs EDIFICIO 1

130 ALUNOS 24+24+24+24+22+12

E1-B1-S1 FA 01 - 24 ALUNOS

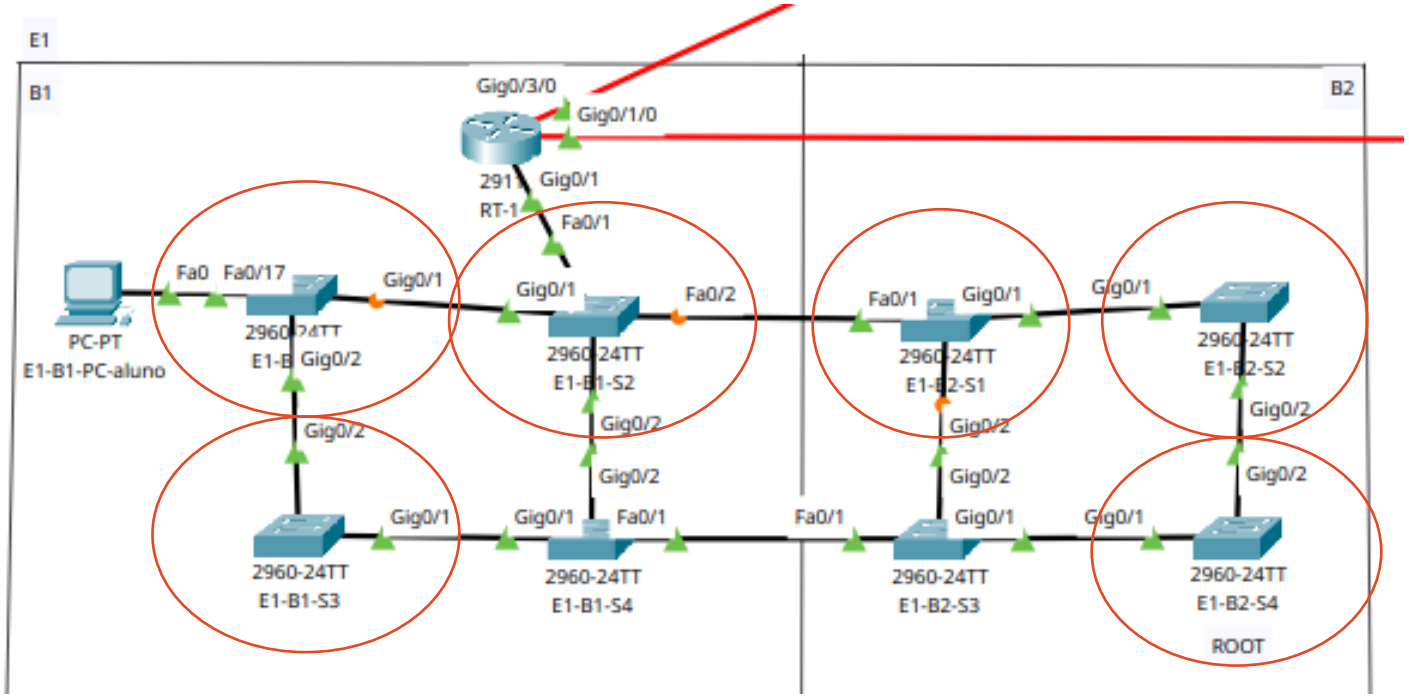
E1-B1-S3 FA 01 - 24 ALUNOS

E1-B1-S2 FA 03 - 24 ALUNOS

E1-B2-S1 FA 02-13 ALUNOS

E1-B2-S2 FA 01-24 ALUNOS

E1-B2-S4 FA 01-24 ALUNOS



VLANs EDIFICIO 1

3 professores

E1-B2-S1 FA 14-16 PROFESSORES

4 telefones

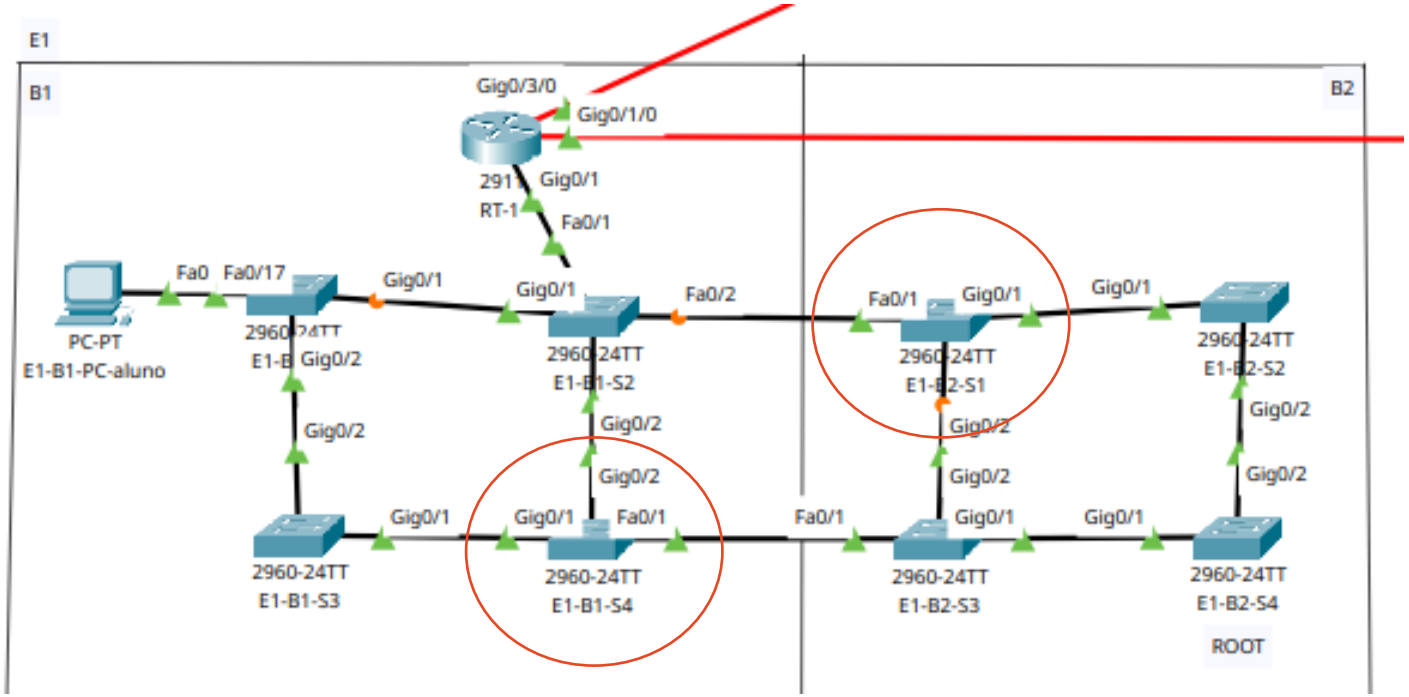
E1-B1-S4 FA 02-05 TELEFONE

5 convidados

E1-B2-S1 FA 17-21 CONVIDADOS

3 avac

E1-B2-S1 FA 22-24 AVAC



VLANs EDIFICIO 1

1 tv

E1-B1-S4 FA 06 TV

5 cctv

E1-B1-S4 FA 07-11 CCTV

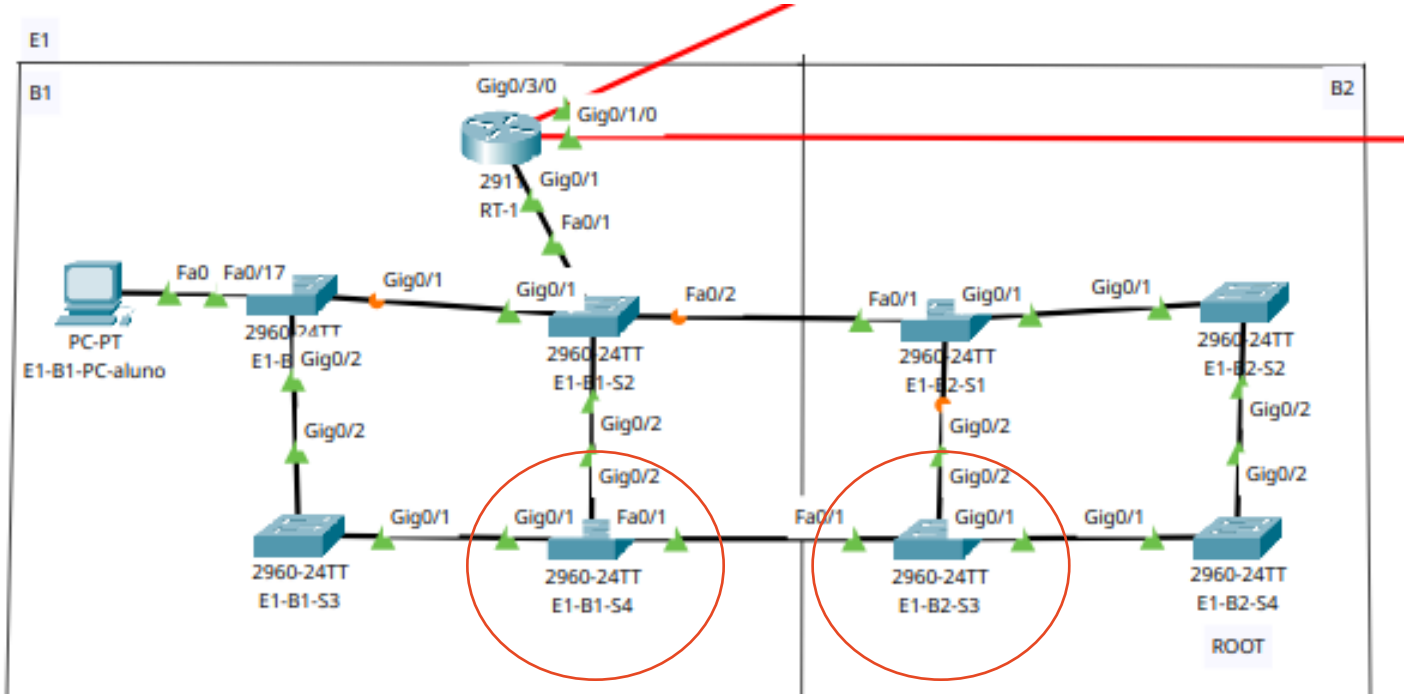
3 impressoras

E1-B1-S4 FA 12-14 IMPRESSORA

Todas interfaces que não foram utilizadas **foram DESLIGADAS!**

E1-B2-S3

Fa0/2 até 24 **shutdown**



VLANs EDIFICIO 2

PCs para alunos: 100 (24+24+24+24+4)

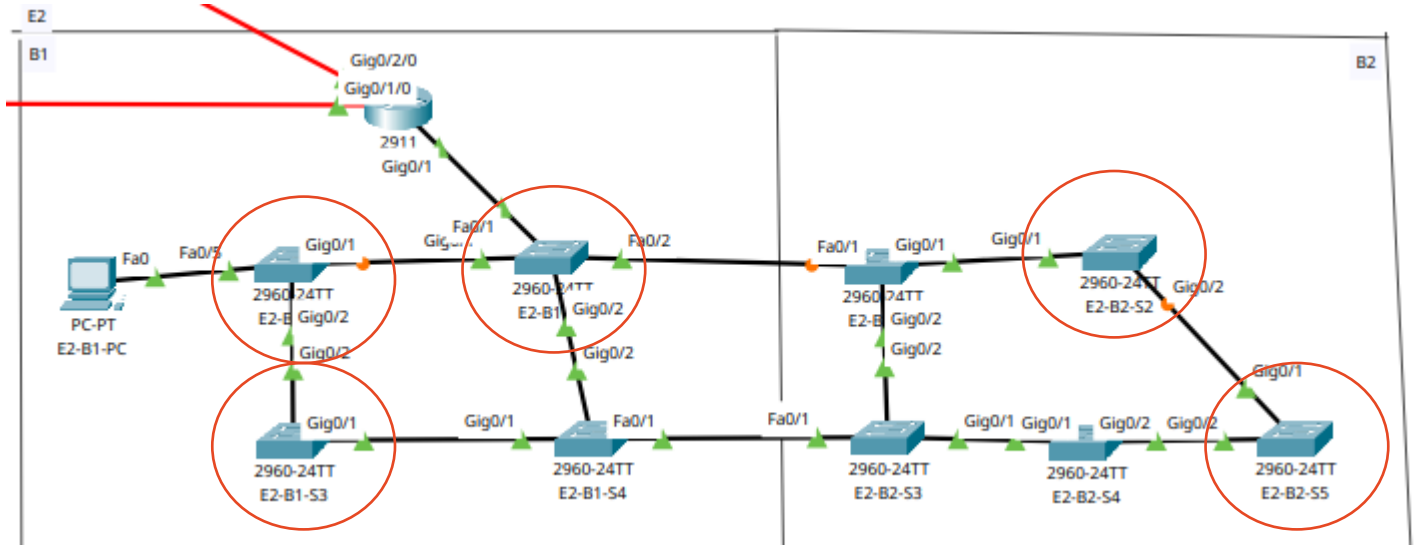
E2-B1-S1 FA 01-24 Alunos

E2-B1-S2FA 03-06 Alunos

E2-B1-S3 FA 01-24 Alunos

E2-B2-S2FA 01-24 Alunos

E2-B2-S5FA 01-24 Alunos



VLANs EDIFICIO 2

8 Professores

E2-B1-S2 FA 07-14 Professores

1 Convidado

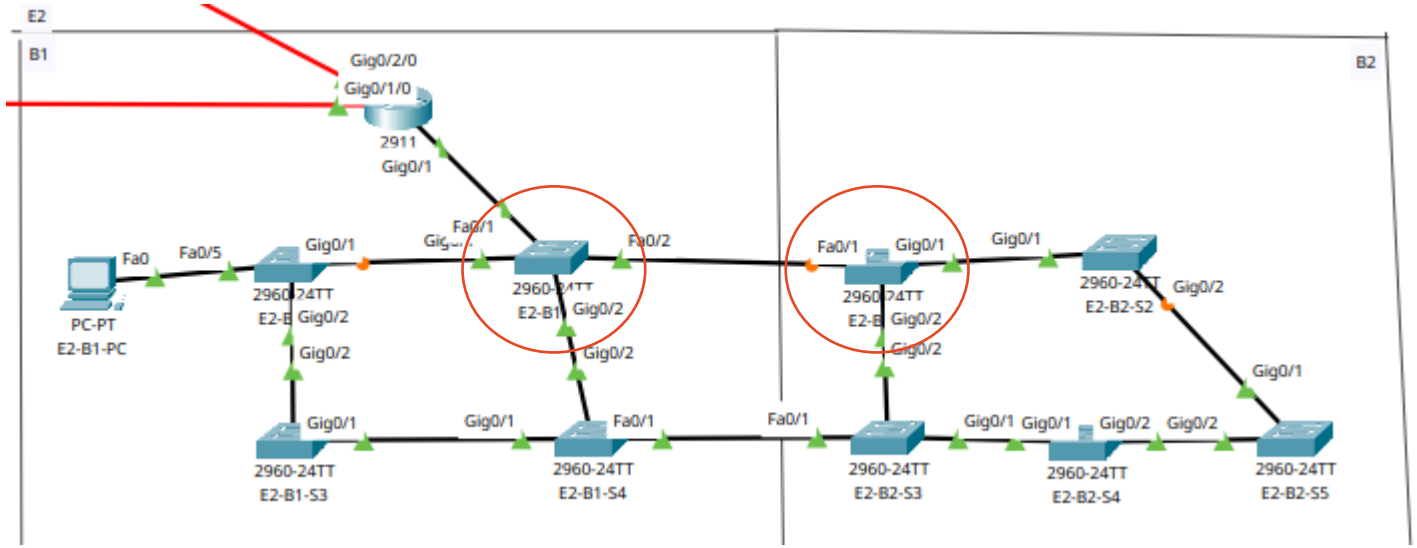
E2-B1-S2FA 15 Convidado

7 Concelho de Gestão

E2-B1-S2FA 16-22 Conselho de gestão

10 Académicos

E2-B2-S1FA 02-11 serviços académicos



VLANs EDIFICIO 2

4 Informatica

E2-B2-S1FA 12-15 Informatica

29 Telefones

E2-B1-S4FA 02-24 Telefones

E2-B2-S3FA 19-24 Telefones

11 Impressoras

E2-B2-S3FA 02-12 Impressora

5 TVS

E2-B2-S4 FA 01-24 TV

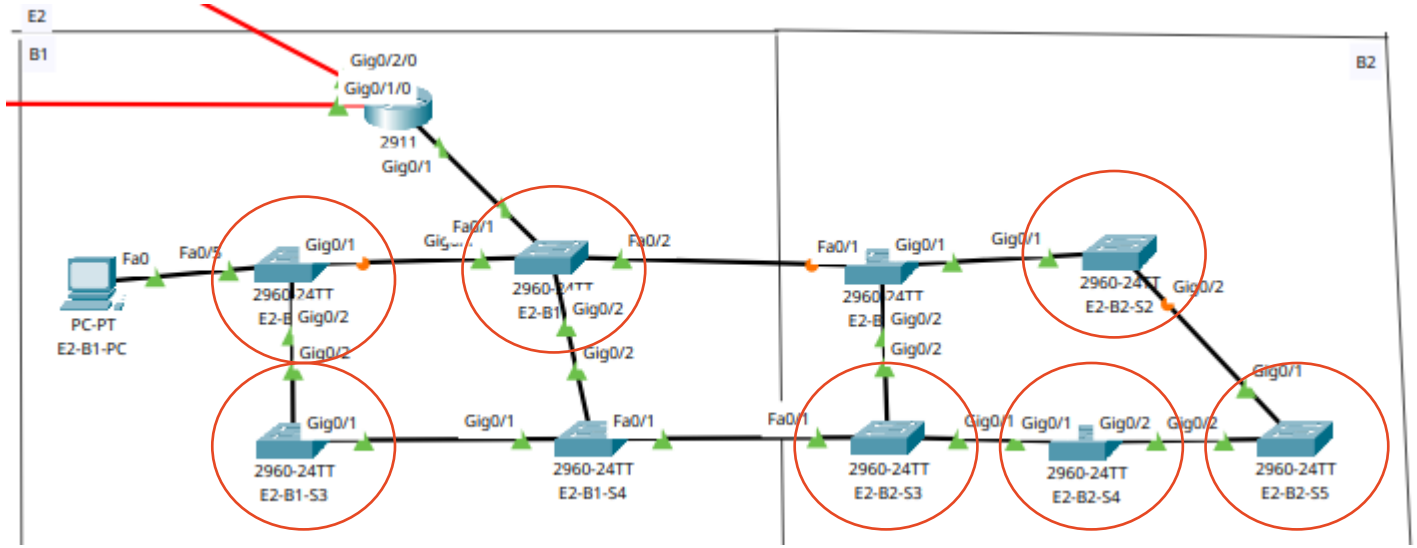
8 CCTV

E2-B2-S1FA 16-23 CCTV

Todas interfaces que não foram utilizadas **foram DESLIGADAS!**

6 AVAC

E2-B2-S3FA 13-18 AVAC



Endereçamento IPV4 (Ed. 1)

ALUNOS
Necessidade: 130 IPs
Sub-rede: 192.168.0.0/24 (256 endereços, 254 utilizáveis)

PROFESSORES
Necessidade: 3 IPs
Sub-rede: 192.168.1.0/29 (8 endereços, 6 utilizáveis, 192.168.1.1 a 192.168.1.6)

TELEFONES
Necessidade: 4 IPs
Sub-rede: 192.168.1.8/29 (8 endereços, 6 utilizáveis, 192.168.1.9 a 192.168.1.14)

IMPRESSORAS
Necessidade: 3 IPs
Sub-rede: 192.168.1.16/29 (8 endereços, 6 utilizáveis, 192.168.1.17 a 192.168.1.22)

Endereçamento IPV4 (Ed. 1)

ALUNOS Rede: 192.168.0.0/24 (256 endereços, 254 utilizáveis)

PROFESSORES Rede: 192.168.1.0/29 (8 endereços, 6 utilizáveis, 192.168.1.1 a 192.168.1.6)

TELEFONES Rede: 192.168.1.8/29 (8 endereços, 6 utilizáveis, 192.168.1.9 a 192.168.1.14)

IMPRESSORAS Rede: 192.168.1.16/29 (8 endereços, 6 utilizáveis, 192.168.1.17 a 192.168.1.22)

CCTV Rede: 192.168.1.24/29 (8 endereços, 6 utilizáveis, 192.168.1.25 a 192.168.1.30)

AVAC Rede: 192.168.1.32/29 (8 endereços, 6 utilizáveis, 192.168.1.33 a 192.168.1.38)

TV Rede 192.168.1.180/30 (4 endereços, 2 utilizáveis, 192.168.1.181 a 192.168.1.182)

CONVIDADOS Rede: 192.168.1.48/28 (16 endereços, 14 utilizáveis, 192.168.1.49 a 192.168.1.62)

Endereçamento IPV4 (Ed. 2)

ALUNOS Rede: 192.168.2.128/25 (128 endereços, 126 utilizáveis, 192.168.2.129 a 192.168.2.254)

PROFESSORES Rede: 192.168.3.0/28 (16 endereços, 14 utilizáveis, 192.168.3.1 a 192.168.3.14)

TELEFONES Rede: 192.168.2.64/26 (64 endereços, 62 utilizáveis, 192.168.2.65 - 192.168.2.126)

IMPRESSORAS 192.168.3.64/27 (32 endereços, 30 utilizáveis, 192.168.3.65 - 192.168.3.94)

CCTV Rede: 192.168.2.16/28 (16 endereços, 14 utilizáveis, 192.168.2.17 a 192.168.2.30)

AVAC Rede: 192.168.3.112/28 (16 endereços, 14 utilizáveis, 192.168.3.113 - 192.168.3.126)

TV Rede 192.168.2.16/28 (16 endereços, 14 utilizáveis, 192.168.2.17 a 192.168.2.30)

CONVIDADOS Rede: 192.168.3.104/29 (8 endereços, 6 utilizáveis, 192.168.3.105 a 192.168.3.110)

Endereçamento IPV4 (Ed. 2)

GESTÃO Rede: 192.168.3.16/28 (16 endereços, 14 utilizáveis, 192.168.3.17 a 192.168.3.30)

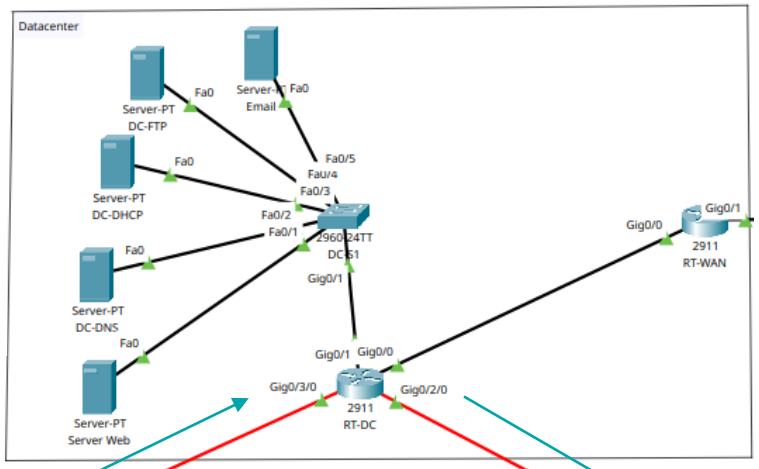
INFORMÁTICA Rede: 192.168.3.48/29 (8 endereços, 6 utilizáveis, 192.168.3.49 a 192.168.3.54)

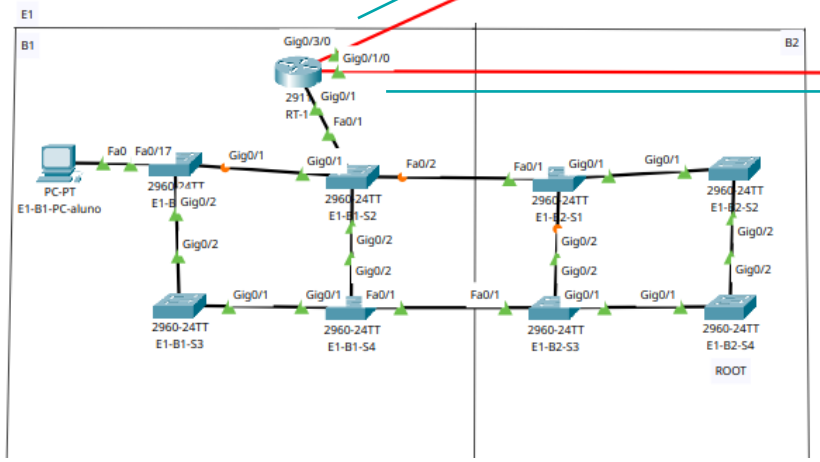
ACADEMICO Rede: 192.168.3.32/28 (16 endereços, 14 utilizáveis, 192.168.3.33 a 192.168.3.46)

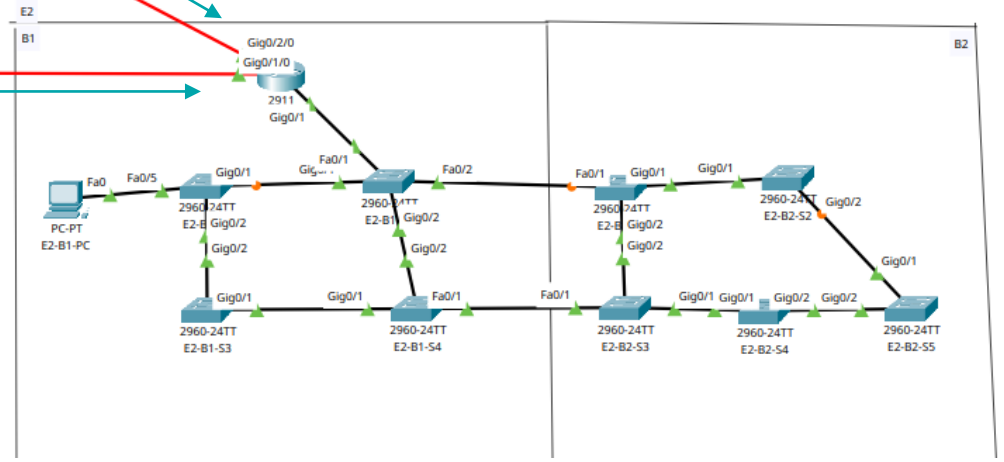
Routing Estático

```
RT-2#sh ip route static
S    192.168.0.0/24 [1/0] via 192.168.1.217
     192.168.1.0/24 is variably subnetted, 12 subnets, 5 masks
S       192.168.1.0/29 [1/0] via 192.168.1.217
S       192.168.1.8/29 [1/0] via 192.168.1.217
S       192.168.1.16/29 [1/0] via 192.168.1.217
S       192.168.1.24/29 [1/0] via 192.168.1.217
S       192.168.1.32/29 [1/0] via 192.168.1.217
S       192.168.1.48/28 [1/0] via 192.168.1.217
S       192.168.1.128/25 [1/0] via 192.168.1.221
S       192.168.1.180/30 [1/0] via 192.168.1.217
```

```
RT-DC#sh ip route static
S    192.168.0.0/24 [1/0] via 192.168.1.213
     192.168.1.0/24 is variably subnetted, 13 subnets, 4 masks
S       192.168.1.0/29 [1/0] via 192.168.1.213
S       192.168.1.8/29 [1/0] via 192.168.1.213
S       192.168.1.16/29 [1/0] via 192.168.1.213
S       192.168.1.24/29 [1/0] via 192.168.1.213
S       192.168.1.32/29 [1/0] via 192.168.1.213
S       192.168.1.48/28 [1/0] via 192.168.1.213
S       192.168.1.180/30 [1/0] via 192.168.1.213
     192.168.2.0/24 is variably subnetted, 4 subnets, 3 masks
S       192.168.2.0/28 [1/0] via 192.168.1.222
S       192.168.2.16/28 [1/0] via 192.168.1.222
S       192.168.2.64/26 [1/0] via 192.168.1.222
S       192.168.2.128/25 [1/0] via 192.168.1.222
     192.168.3.0/24 is variably subnetted, 7 subnets, 3 masks
S       192.168.3.0/28 [1/0] via 192.168.1.222
S       192.168.3.16/28 [1/0] via 192.168.1.222
S       192.168.3.32/28 [1/0] via 192.168.1.222
S       192.168.3.48/29 [1/0] via 192.168.1.222
S       192.168.3.64/27 [1/0] via 192.168.1.222
S       192.168.3.104/29 [1/0] via 192.168.1.222
S       192.168.3.112/28 [1/0] via 192.168.1.222
```



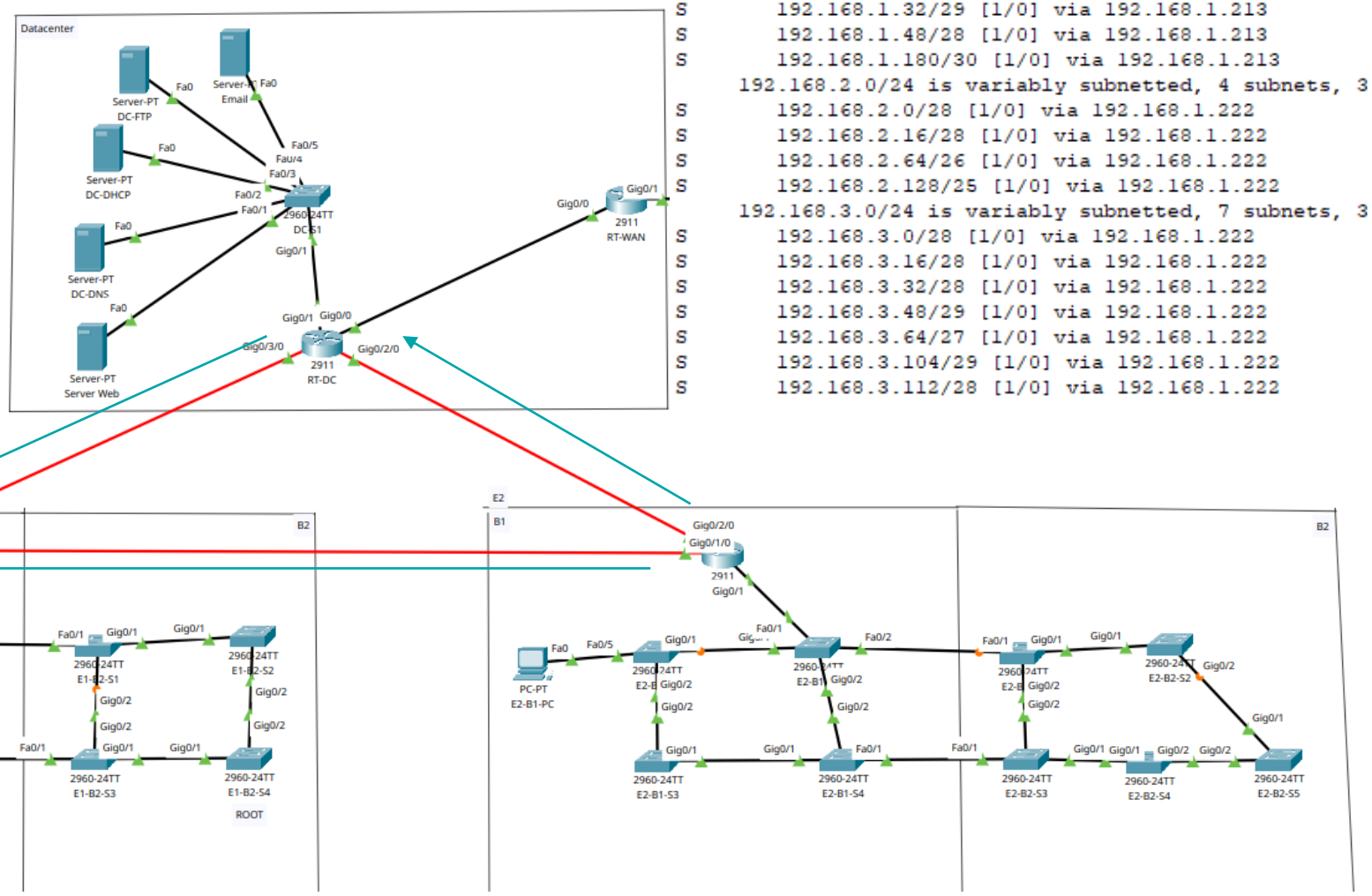




Routing Estático

```
RT-1#sh ip route static
      192.168.1.0/24 is variably subnetted, 19 subnets, 4 masks
S        192.168.1.128/28 [1/0] via 192.168.1.214
      192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
S        192.168.2.64/26 [1/0] via 192.168.1.218
S        192.168.2.128/25 [1/0] via 192.168.1.218
      192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
S        192.168.3.0/28 [1/0] via 192.168.1.218
S        192.168.3.48/29 [1/0] via 192.168.1.218
```

```
RT-DC#sh ip route static
S     192.168.0.0/24 [1/0] via 192.168.1.213
      192.168.1.0/24 is variably subnetted, 13 subnets, 4 masks
S        192.168.1.0/29 [1/0] via 192.168.1.213
S        192.168.1.8/29 [1/0] via 192.168.1.213
S        192.168.1.16/29 [1/0] via 192.168.1.213
S        192.168.1.24/29 [1/0] via 192.168.1.213
S        192.168.1.32/29 [1/0] via 192.168.1.213
S        192.168.1.48/28 [1/0] via 192.168.1.213
S        192.168.1.180/30 [1/0] via 192.168.1.213
      192.168.2.0/24 is variably subnetted, 4 subnets, 3 masks
S        192.168.2.0/28 [1/0] via 192.168.1.222
S        192.168.2.16/28 [1/0] via 192.168.1.222
S        192.168.2.64/26 [1/0] via 192.168.1.222
S        192.168.2.128/25 [1/0] via 192.168.1.222
      192.168.3.0/24 is variably subnetted, 7 subnets, 3 masks
S        192.168.3.0/28 [1/0] via 192.168.1.222
S        192.168.3.16/28 [1/0] via 192.168.1.222
S        192.168.3.32/28 [1/0] via 192.168.1.222
S        192.168.3.48/29 [1/0] via 192.168.1.222
S        192.168.3.64/27 [1/0] via 192.168.1.222
S        192.168.3.104/29 [1/0] via 192.168.1.222
S        192.168.3.112/28 [1/0] via 192.168.1.222
```



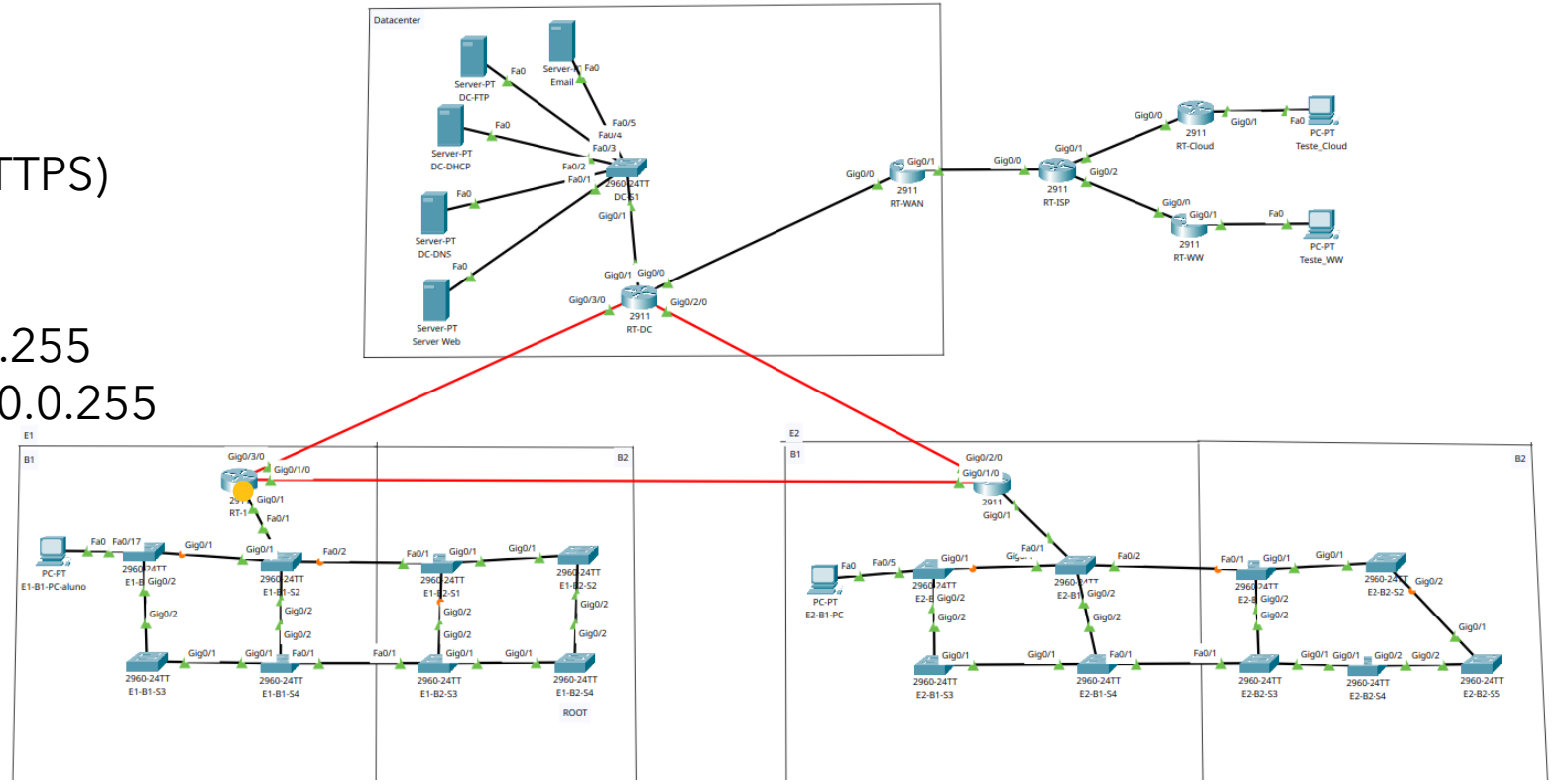
DHCP

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User
TV	192.168.1.181	0.0.0.0	192.168.1.182	255.255.255.252	2
ImpressoraE2	192.168.3.65	0.0.0.0	192.168.3.66	255.255.255.224	30
TelefoneE2	192.168.2.65	0.0.0.0	192.168.2.66	255.255.255.192	62
ConvidadosE2	192.168.3.105	0.0.0.0	192.168.3.106	255.255.255.248	6
AVACE2	192.168.3.113	0.0.0.0	192.168.3.114	255.255.255.240	14
Alunos	192.168.0.1	0.0.0.0	192.168.0.2	255.255.255.0	254
serverPool	192.168.0.1	0.0.0.0	192.168.1.128	255.255.255.240	0
Convidados	192.168.1.49	0.0.0.0	192.168.1.50	255.255.255.240	14
AVAC	192.168.1.33	0.0.0.0	192.168.1.34	255.255.255.248	6
CCTV	192.168.1.25	0.0.0.0	192.168.1.26	255.255.255.248	6
Impressora	192.168.1.17	0.0.0.0	192.168.1.18	255.255.255.248	6
CCTVE2	192.168.2.17	0.0.0.0	192.168.2.18	255.255.255.240	14
TVE2	192.168.2.1	0.0.0.0	192.168.2.2	255.255.255.240	14
AcademicosE2	192.168.3.33	0.0.0.0	192.168.3.34	255.255.255.240	14
InformaticaE2	192.168.3.49	0.0.0.0	192.168.3.50	255.255.255.248	6
AlunosED2	192.168.2.129	0.0.0.0	192.168.2.130	255.255.255.128	126
Telefone	192.168.1.9	0.0.0.0	192.168.1.10	255.255.255.248	6
ConcDeGestaoE2	192.168.3.17	0.0.0.0	192.168.3.18	255.255.255.240	14
ProfessoresED2	192.168.3.1	0.0.0.0	192.168.3.2	255.255.255.240	14
Professores	192.168.1.1	0.0.0.0	192.168.1.2	255.255.255.248	6

ACL RT-1(G0/1.10)

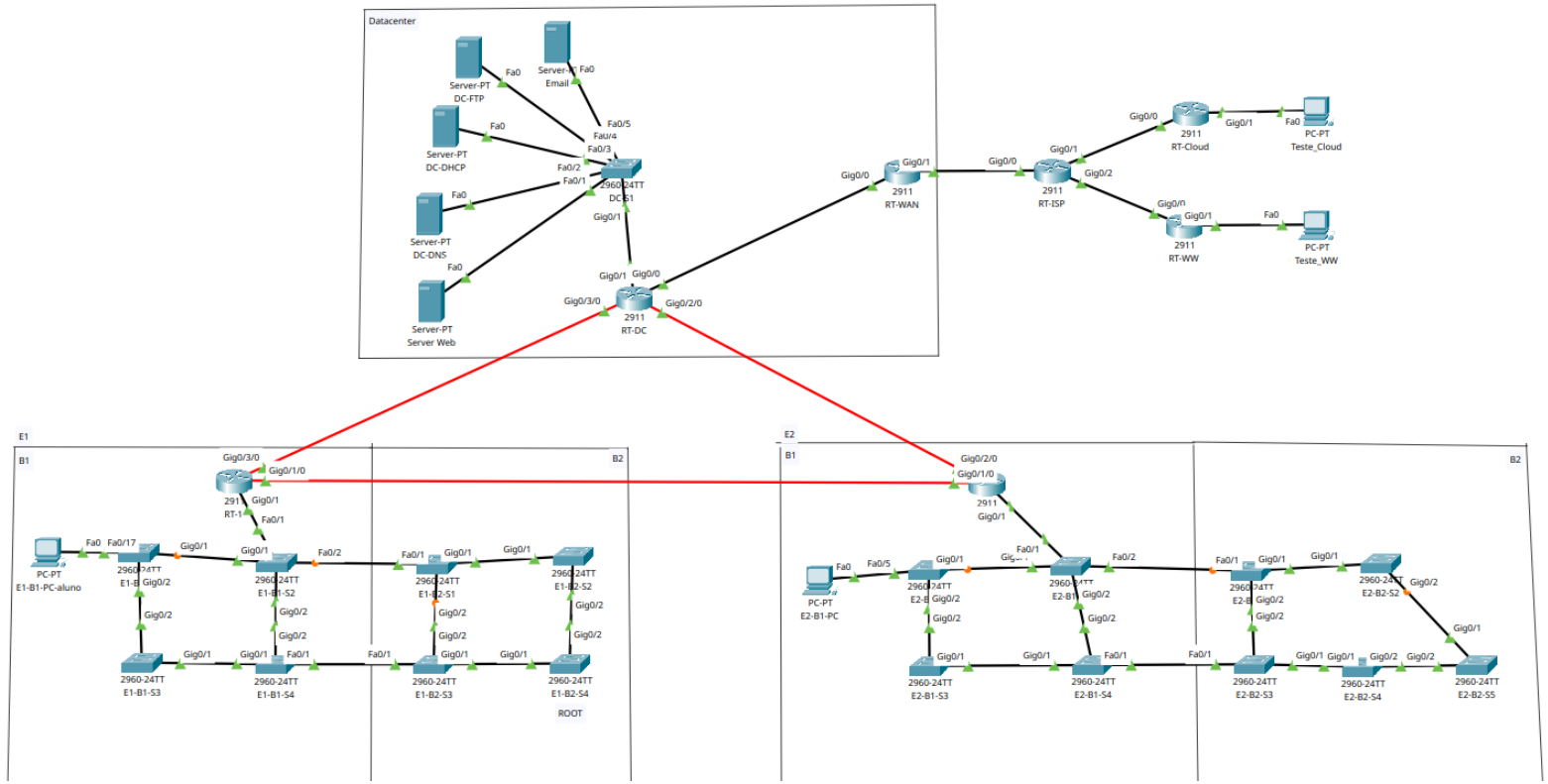
Quem consegue comunicar com Alunos:

- Alunos (IP ICMP)
- Professores (IP ICMP)
- Informatica (IP ICMP)
- Serv. Internos (IP ICMP TCP HTTP HTTPS)
- DENY a todos dentro da rede
- Permit Internet
  - permit ip any 192.168.0.0 0.0.0.255
  - permit icmp any 192.168.0.0 0.0.0.255



ACL

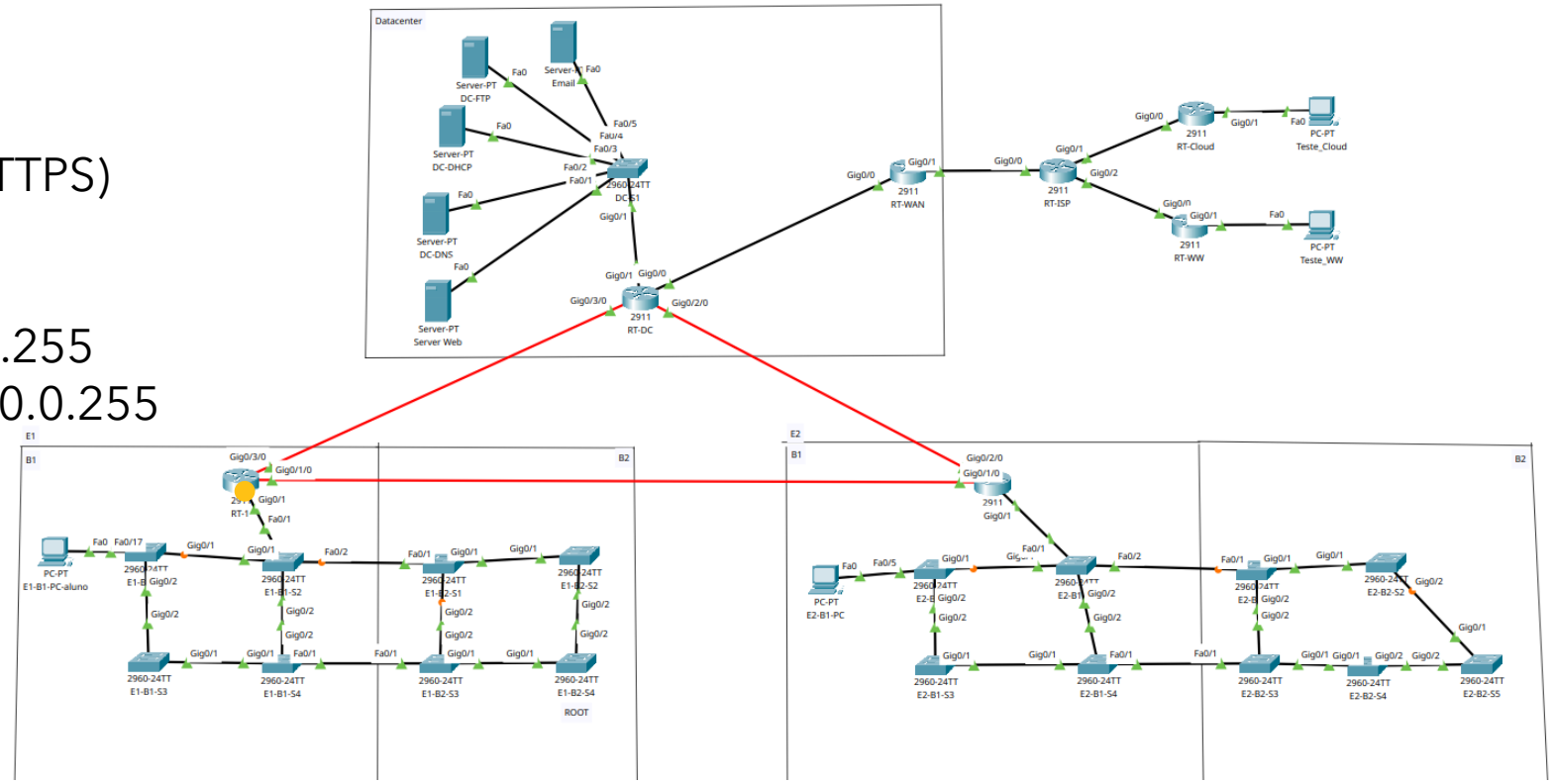
Nossas ACLS cumprem com os requisitos de conetividade.
No total foram implementadas 20 ACLS
espalhadas pela nossa topologia.



ACL Exemplo RT-1(G0/1.10)

Quem consegue comunicar com Alunos:

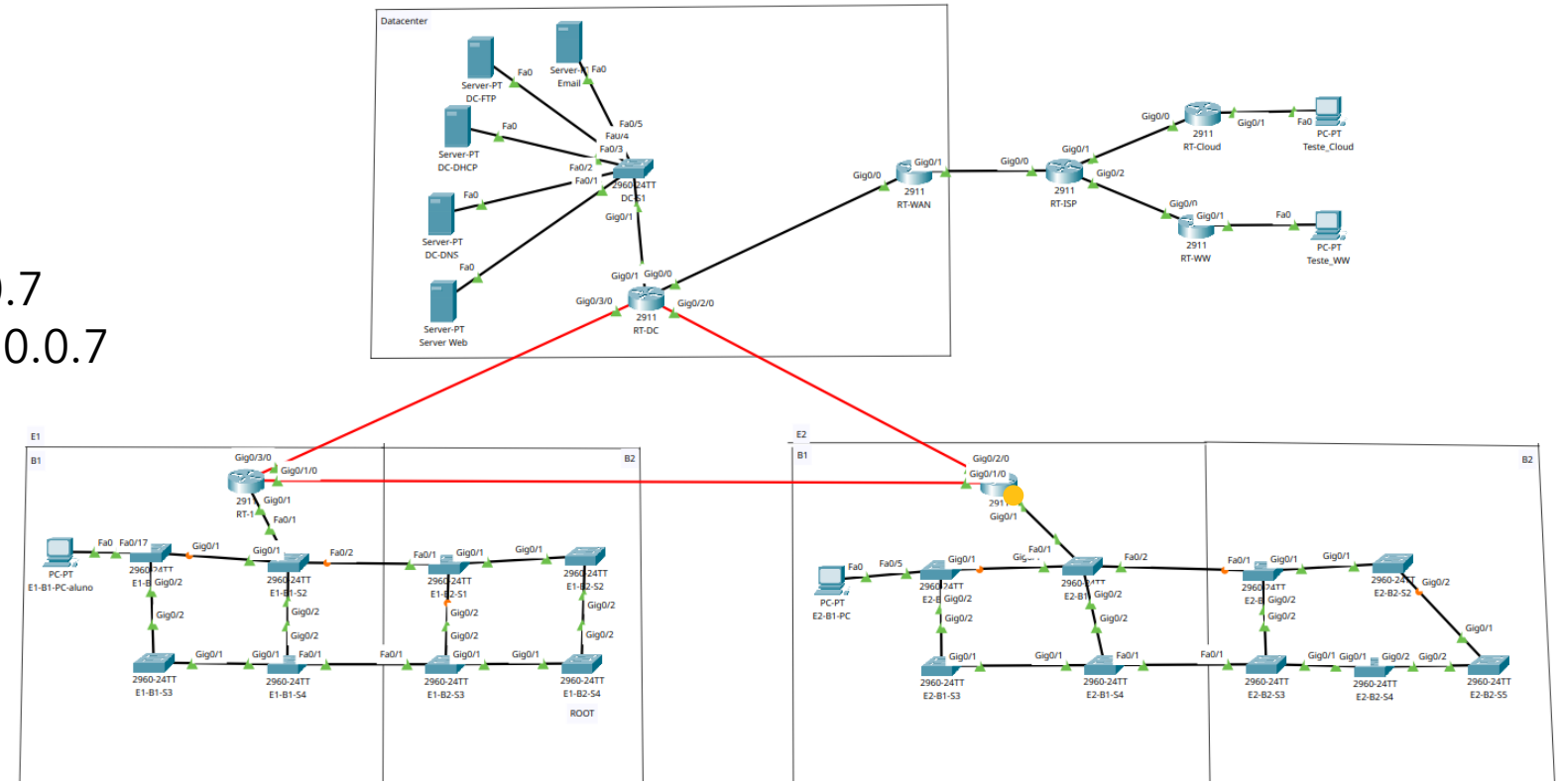
- Alunos (IP ICMP)
- Professores (IP ICMP)
- Informática (IP ICMP)
- Serv. Internos (IP ICMP TCP HTTP HTTPS)
- DENY a todos dentro da rede
- Permit Internet
  - permit ip any 192.168.0.0 0.0.0.255
  - permit icmp any 192.168.0.0 0.0.0.255



ACL Exemplo RT-2(G0/1.20)

Quem consegue comunicar com Professores:

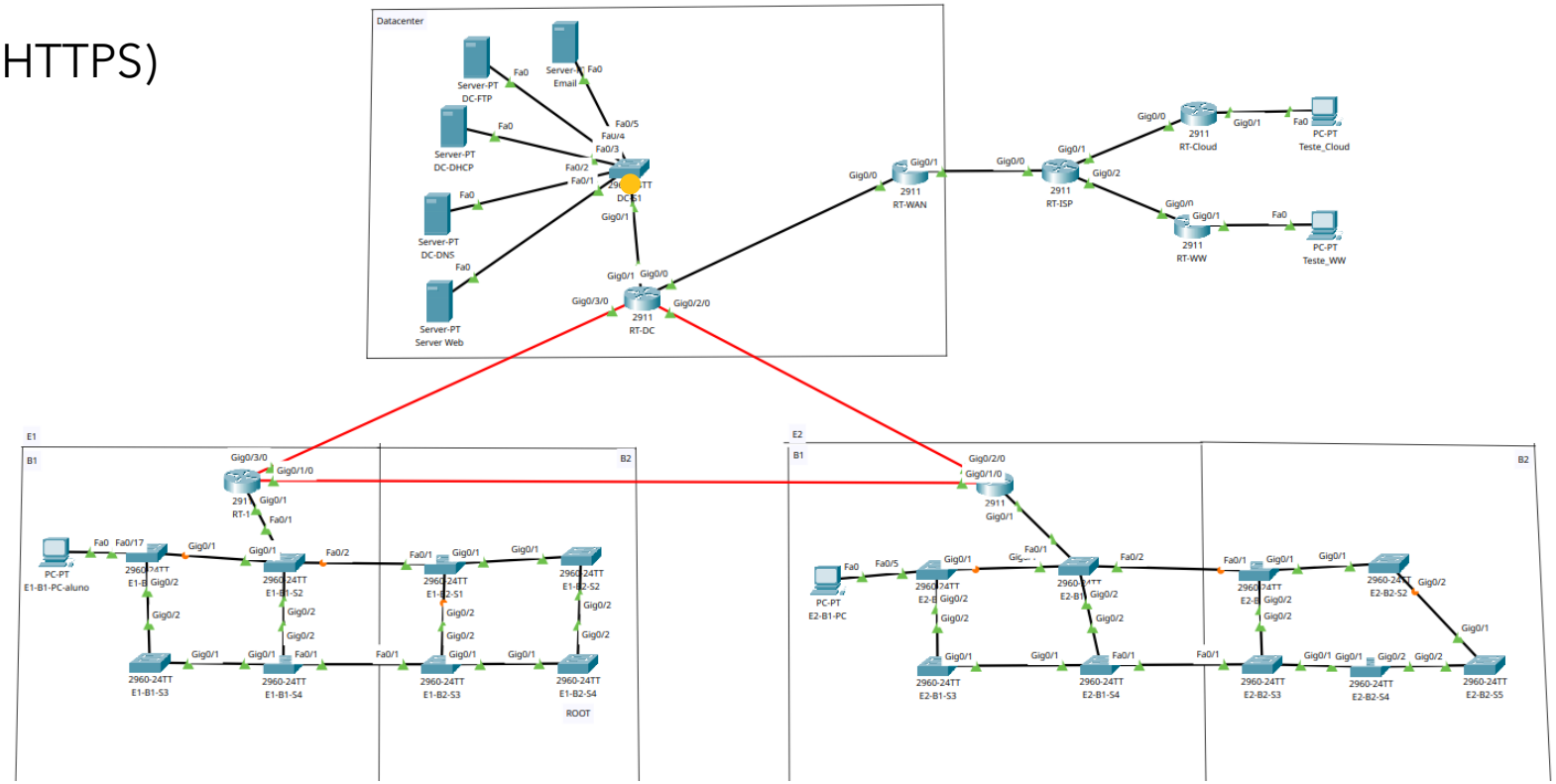
- Alunos (IP ICMP)
- Professores (IP ICMP)
- Informática (IP ICMP)
- DENY a todos dentro da rede
- Permit Internet
  - permit ip any 192.168.1.0 0.0.0.7
  - permit icmp any 192.168.1.0 0.0.0.7



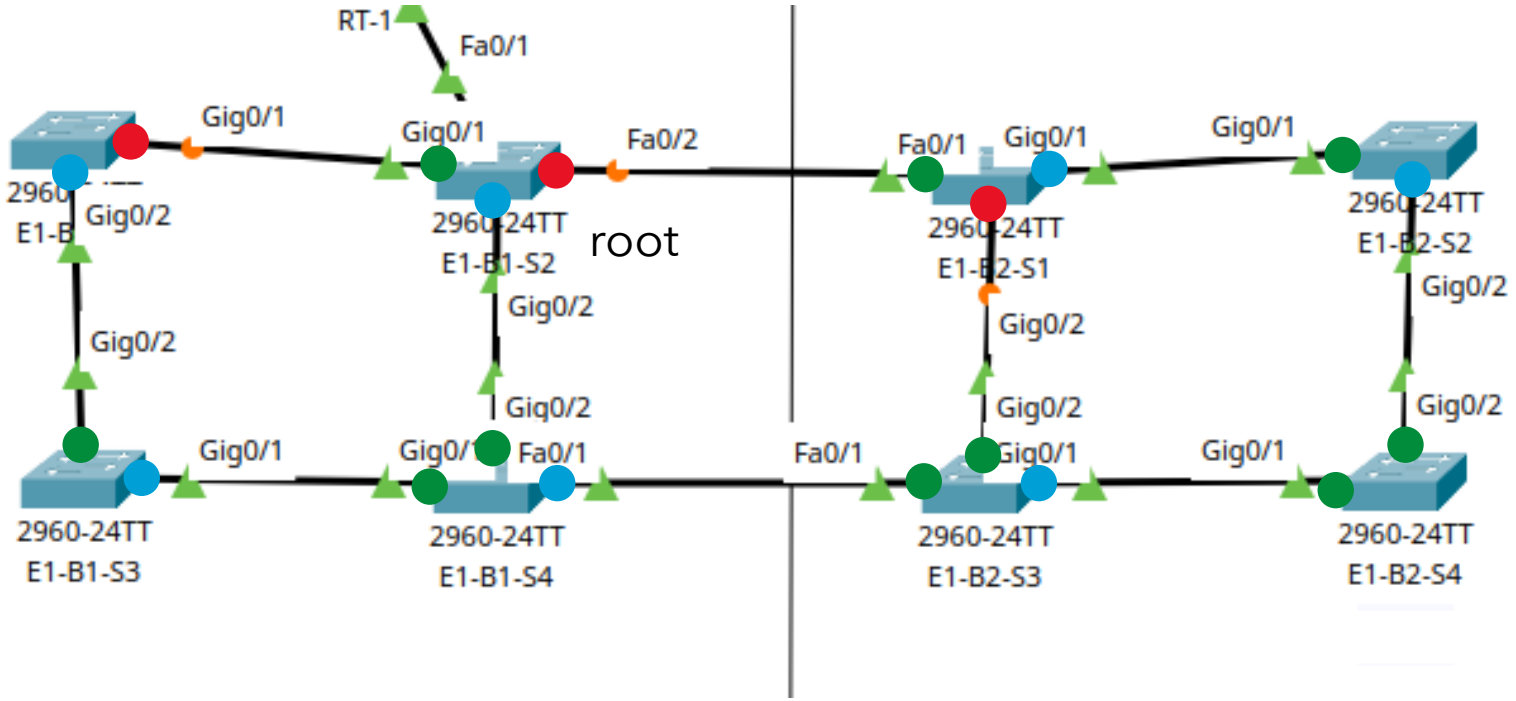
ACL Exemplo RT-DC(G0/1.130)

Quem consegue comunicar com os Serv. Internos:

- Todos -> DHCP (bootps bootpc)
- Alunos -> Servidor Web (TCP HTTP HTTPS)
- Alunos -> DNS (DNS)
- Deny TCP ANY ANY
- Deny UDP ANY ANY
- Deny ICMP ANY ANY

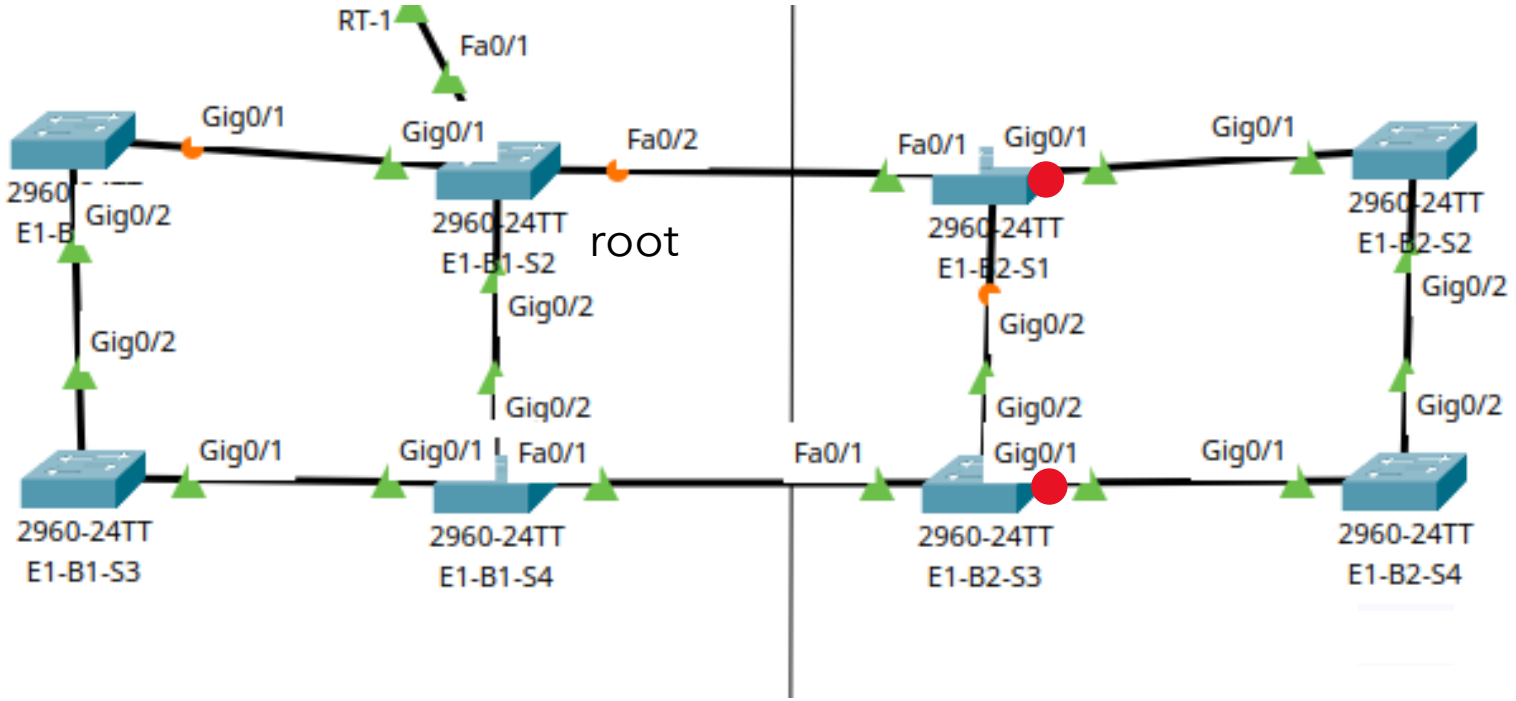


STP Ed.1



- Root
- Designated
- Blocked

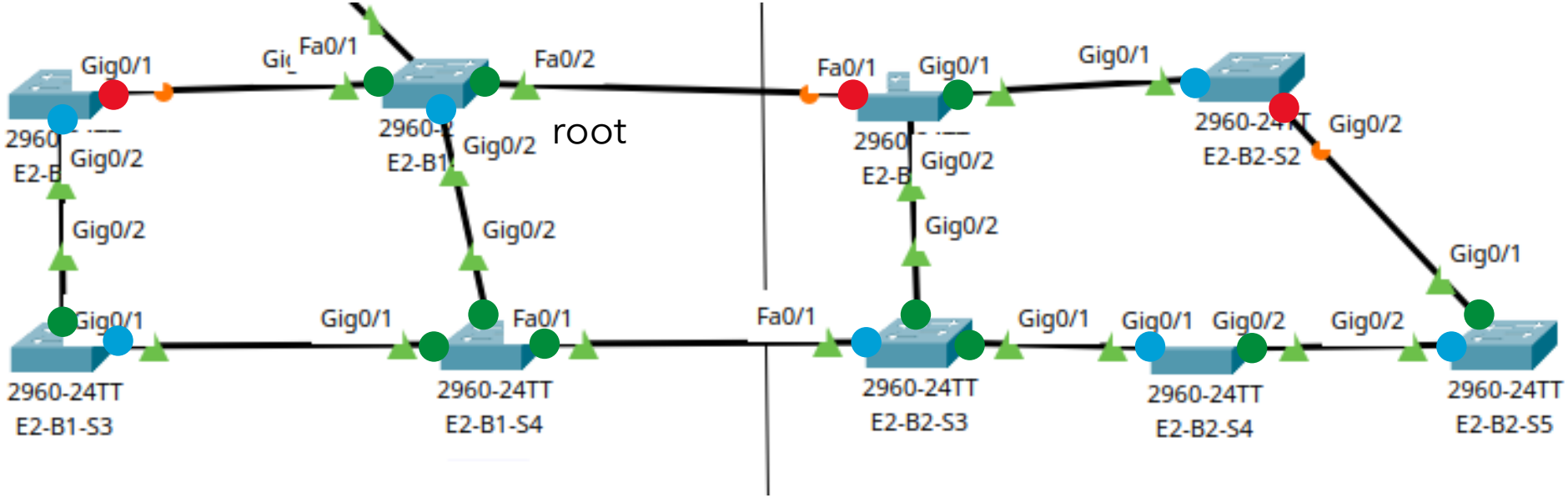
STP Security Ed.1



- Root Guard

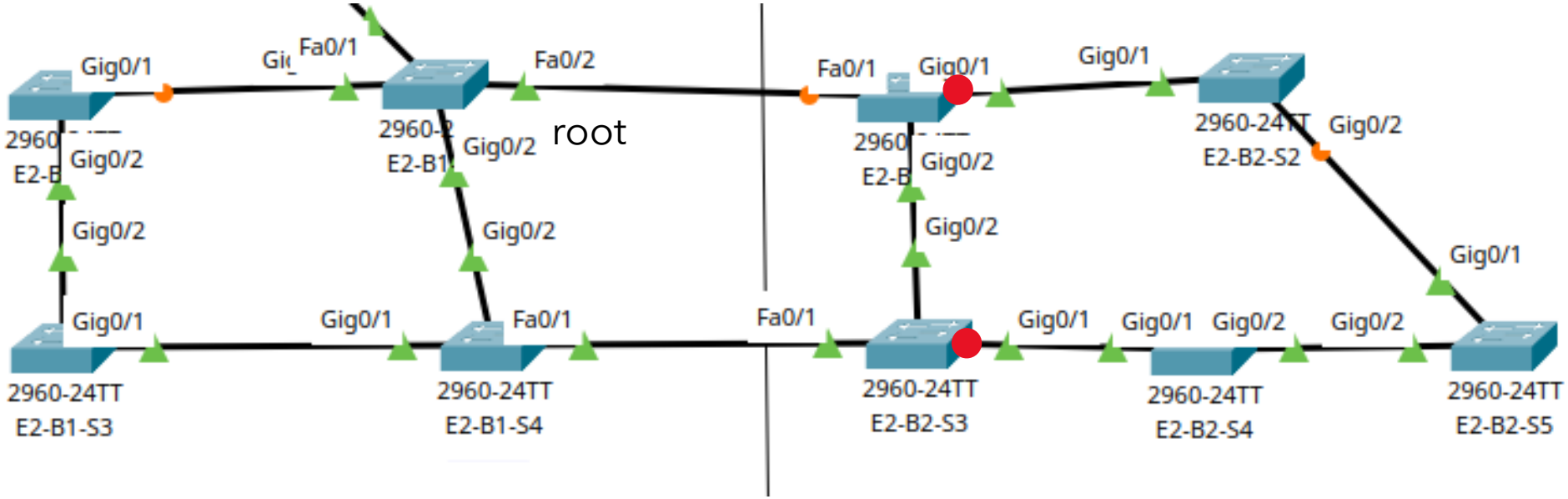
Em todas as interfaces de acesso foram utilizados os comandos:
spanning-tree portfast
spanning-tree bpduguard enable

STP Ed.2



- Root
- Designated
- Blocked

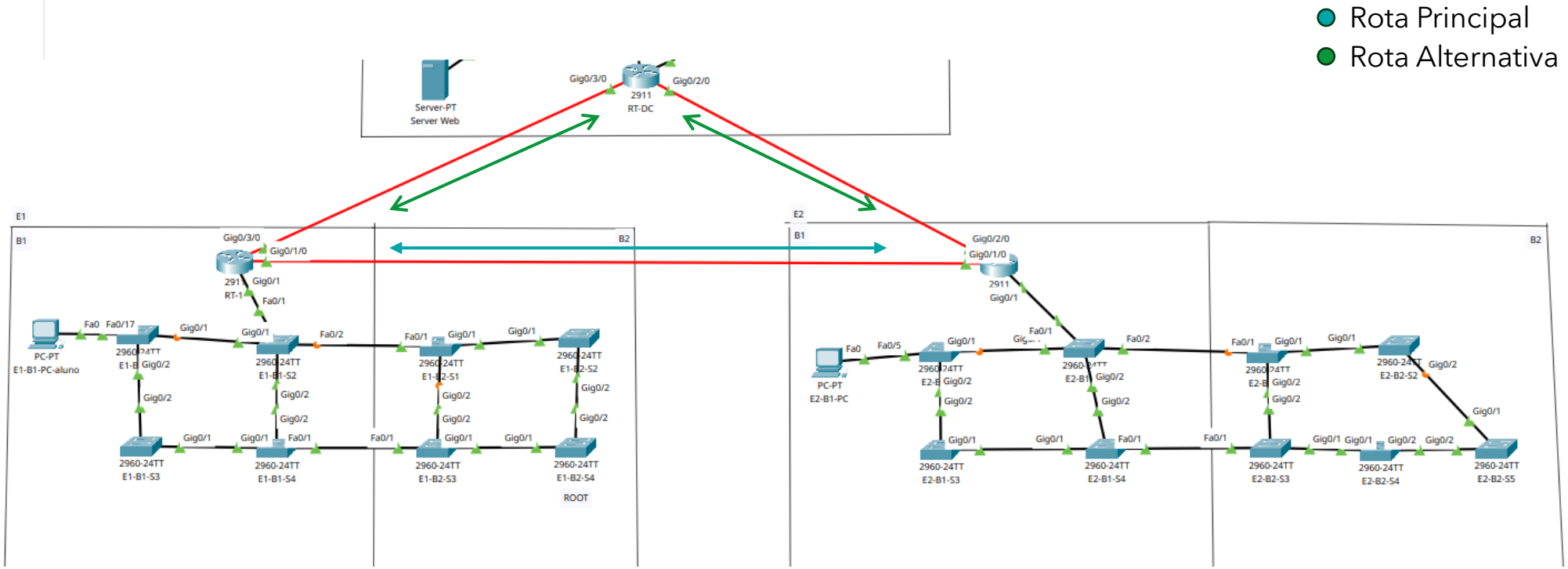
STP Security Ed.2



- Root Guard

Em todas as interfaces de acesso foram utilizados os comandos:
spanning-tree portfast
spanning-tree bpduguard enable

Redundância de Layer 3



RT-1(config)#ip route 192.168.3.0 255.255.255.240 192.168.1.218
RT-1(config)#ip route 192.168.3.0 255.255.255.240 192.168.1.214 10
RT-2(config)#ip route 192.168.1.0 255.255.255.248 192.168.1.217
RT-2(config)#ip route 192.168.1.0 255.255.255.248 192.168.1.221 10