



Monitoramento e Gerenciamento de Redes

- Switching VLANs -

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São Paulo, 2024

Plano de Aula

- **Objetivo**

- Praticar o conceito de VLAN
- Resolver um problema real, de uma rede LAN de um grande centro de pesquisa

- **Conteúdo**

- Switch
- Virtual Local Area Network - VLAN
- *Switch Trunking*
- Subinterfaces dot1q

- **Metodologia**

- Aula prática sobre os conceitos de Switch, VLAN e Trunking, com desenvolvimento de atividade prática e configuração em simulador (*Packet Tracer*).

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt

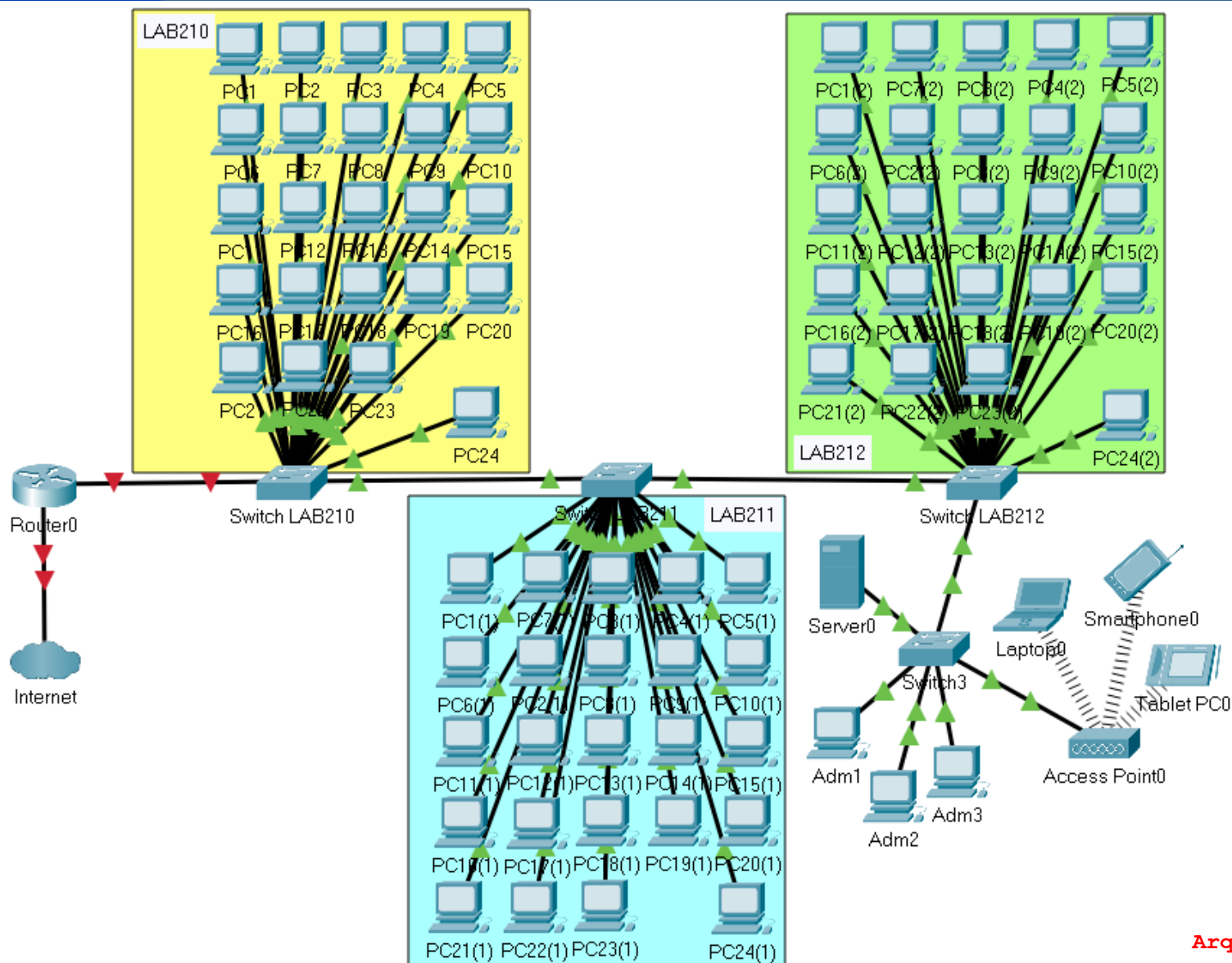
Esta atividade consiste em resolver um problema real, que se apresentou durante a Pandemia COVID21no ano de 2020.

Um grande centro de pesquisa, em uma grande Universidade, foi convidado a participar em um grande projeto de colaboração internacional envolvendo vários outros centros de pesquisa em renomadas universidades ao redor do mundo. O objetivo da pesquisa era sequenciar diretamente o RNA do SARS-CoV-2, o vírus causador da COVID-19

O Centro de Pesquisa ocupa um prédio que possui 4 andares, sendo:

- 1 andar para a equipe administrativa;
- 1 andar para o laboratório envolvido no isolamento viral e cultivo do patógeno em células vero (lab 210);
- 1 andar para o laboratório envolvido na extração do RNA viral e sequenciamento com uma tecnologia portátil (lab 211);
- 1 andar para análise de dados e geração de resultados gráficos que se assemelham ao de um eletroencefalograma, que depois é interpretado com ferramentas de bioinformática (lab 212);
- Em cada andar, um conjunto de equipamentos de microinformática conectados em uma única rede LAN (rede local)

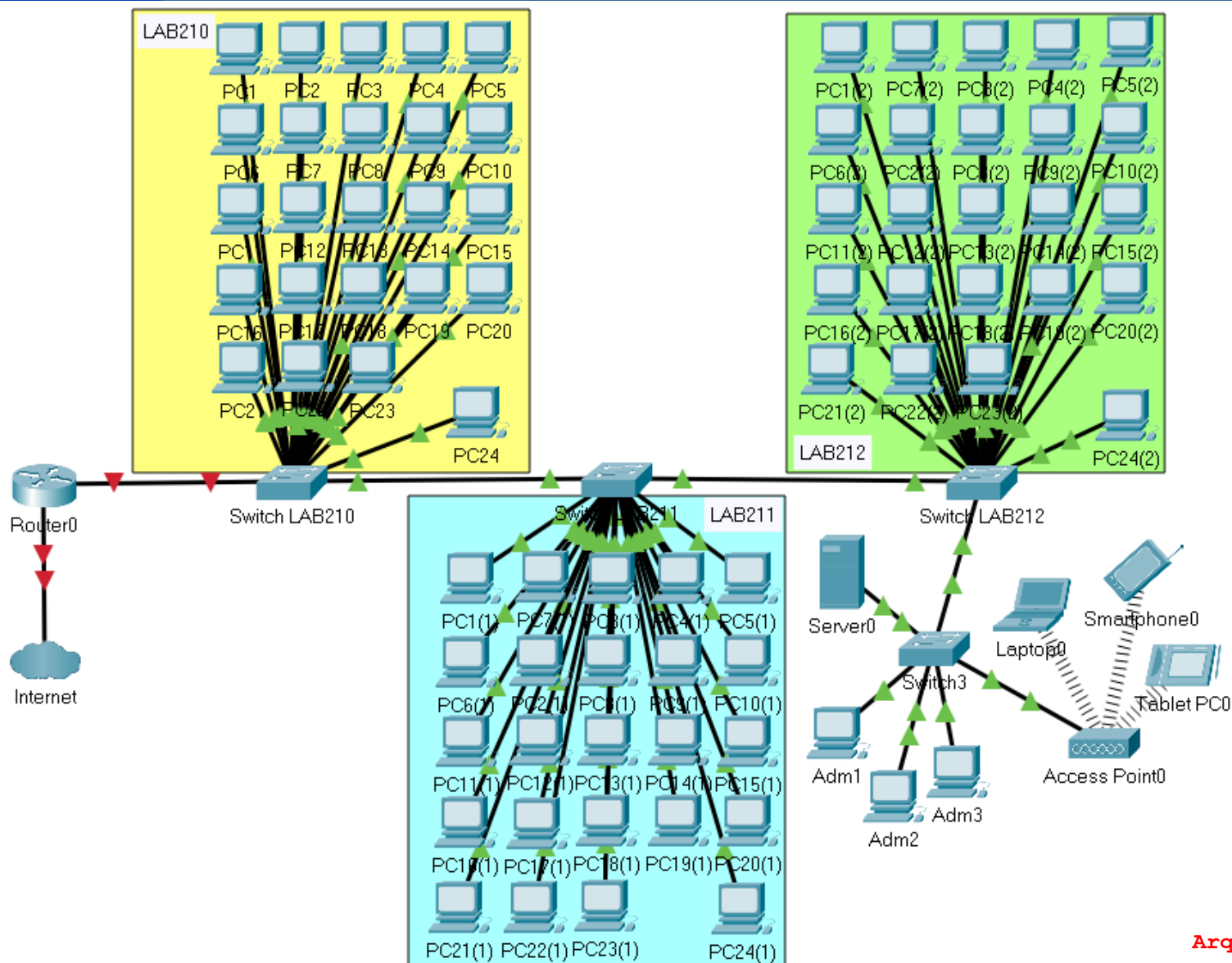
Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



- Neste cenário temos 3 laboratórios de uma instituição de ensino com 24 equipamentos desktops cada uma: 23 para alunos e 1 para o professor (PC24);
- Há um setor administrativo com 3 desktops
- No servidor existente na organização estão os sistemas administrativos e de pesquisa
- Um Access-point permite o acesso à rede por meio de tecnologia Wi-fi.
- Não foi realizada nenhuma configuração especial nos equipamentos de rede neste cenário: os equipamentos estão da mesma forma como entregues pelo fornecedor.

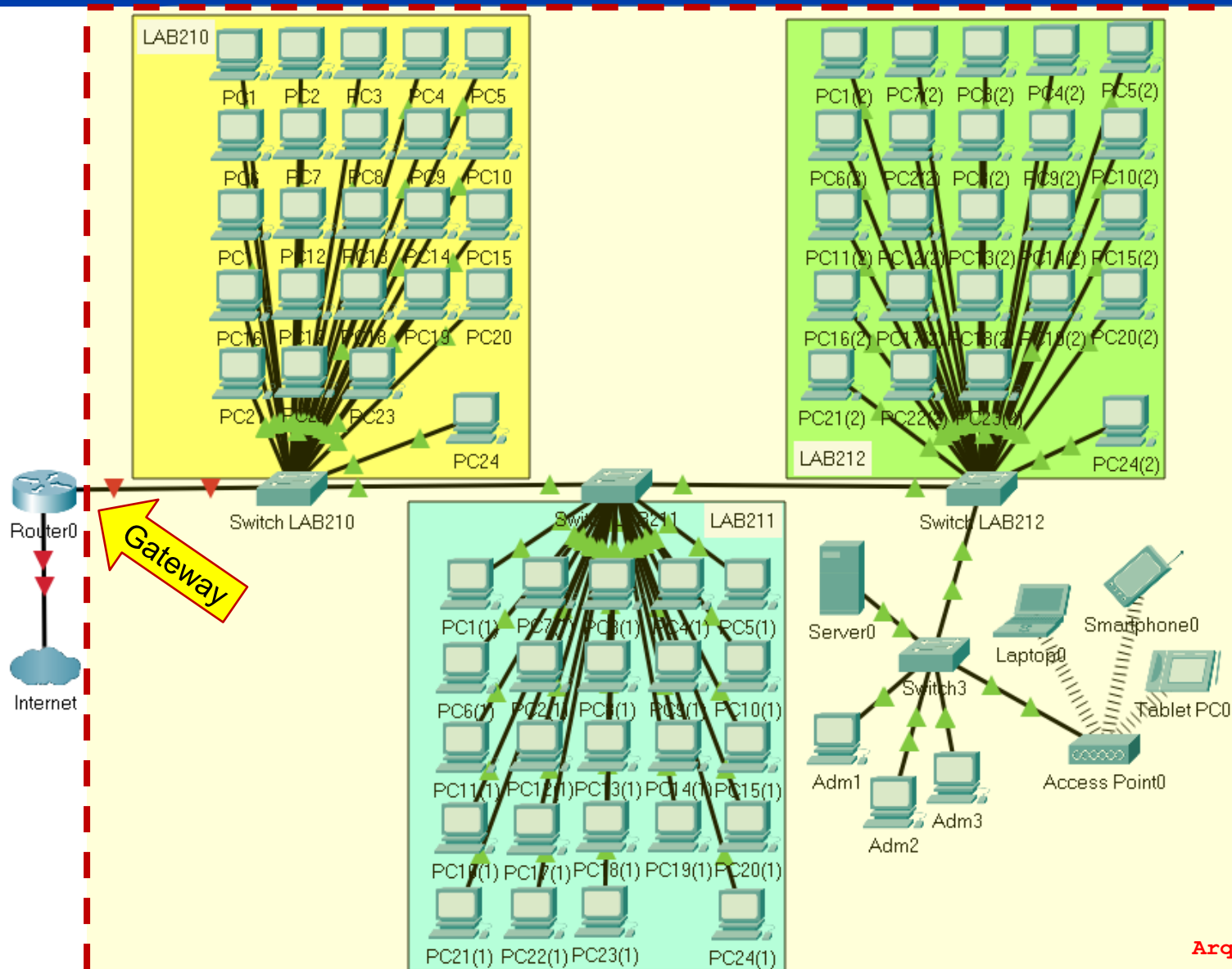
Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



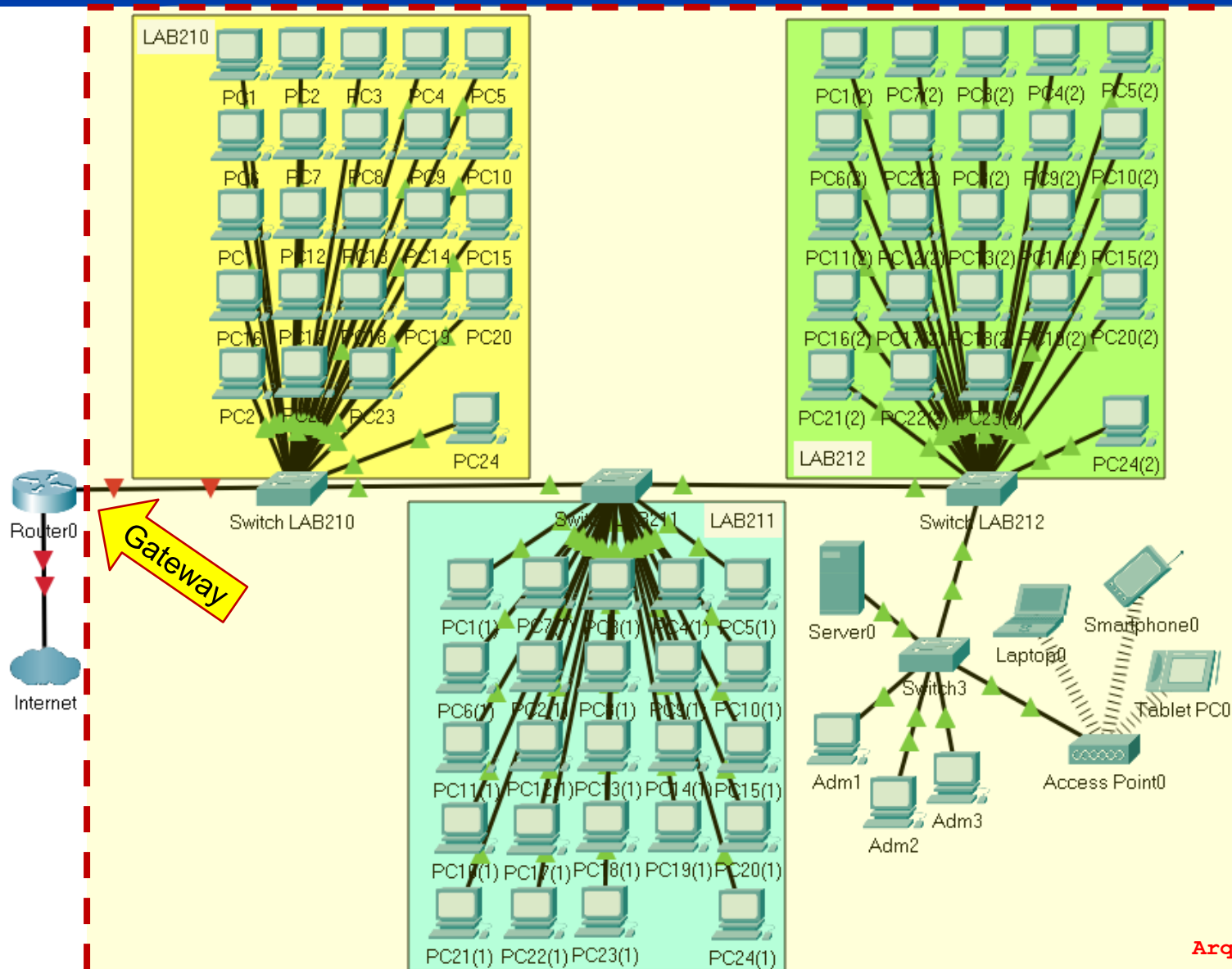
- **Alguns dos principais problemas que surgiram:**
 1. Com o crescimento da rede, passou-se a perceber grande lentidão nas comunicações locais;
 2. Quando o laboratório chamou a atenção da mídia para a importância de sua pesquisa, passou a receber muitos ataques com origem na internet;
 3. O access-point tornou-se um ponto falho, pois uma vez conectado na rede Wi-Fi, os usuários estavam na rede local e passaram a ter acesso direto ao servidor

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



Inicialmente, a topologia física apresenta
Uma única rede com um único domínio de broadcast

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt

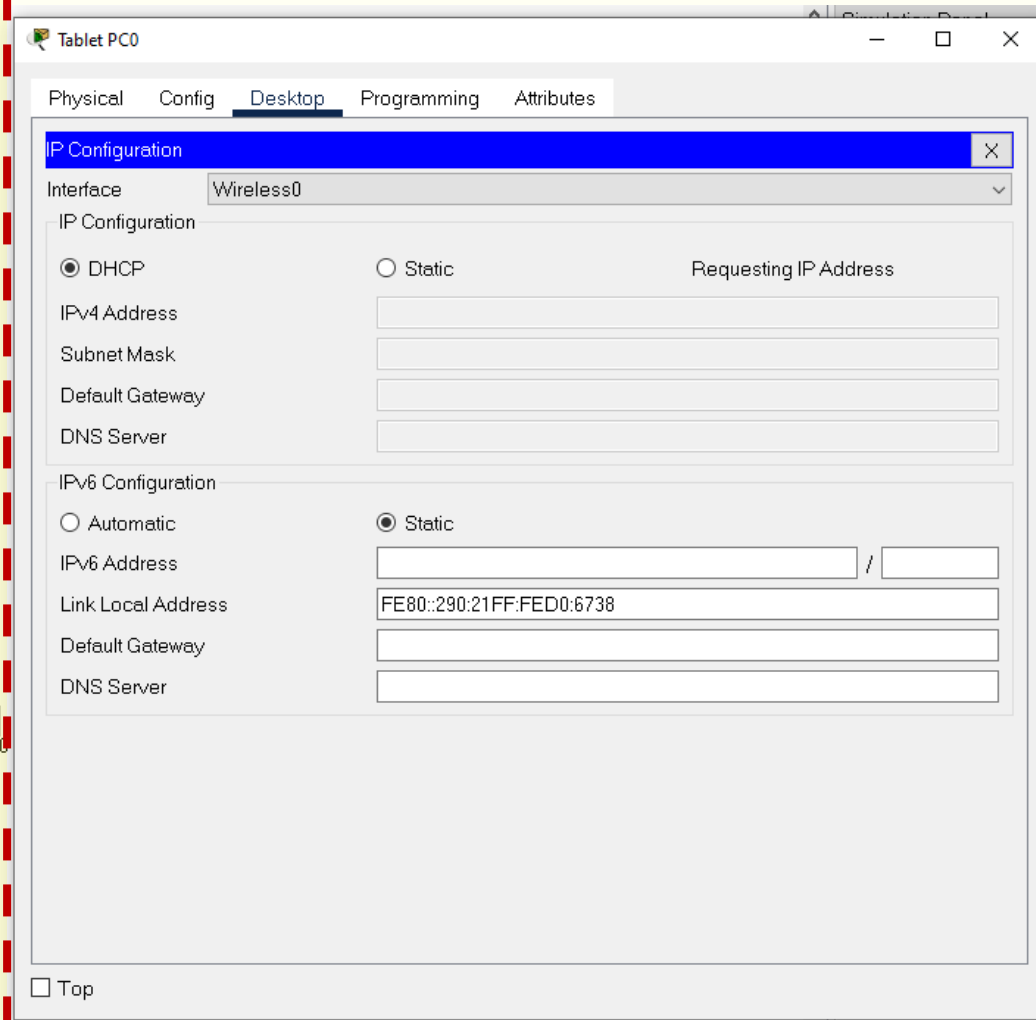
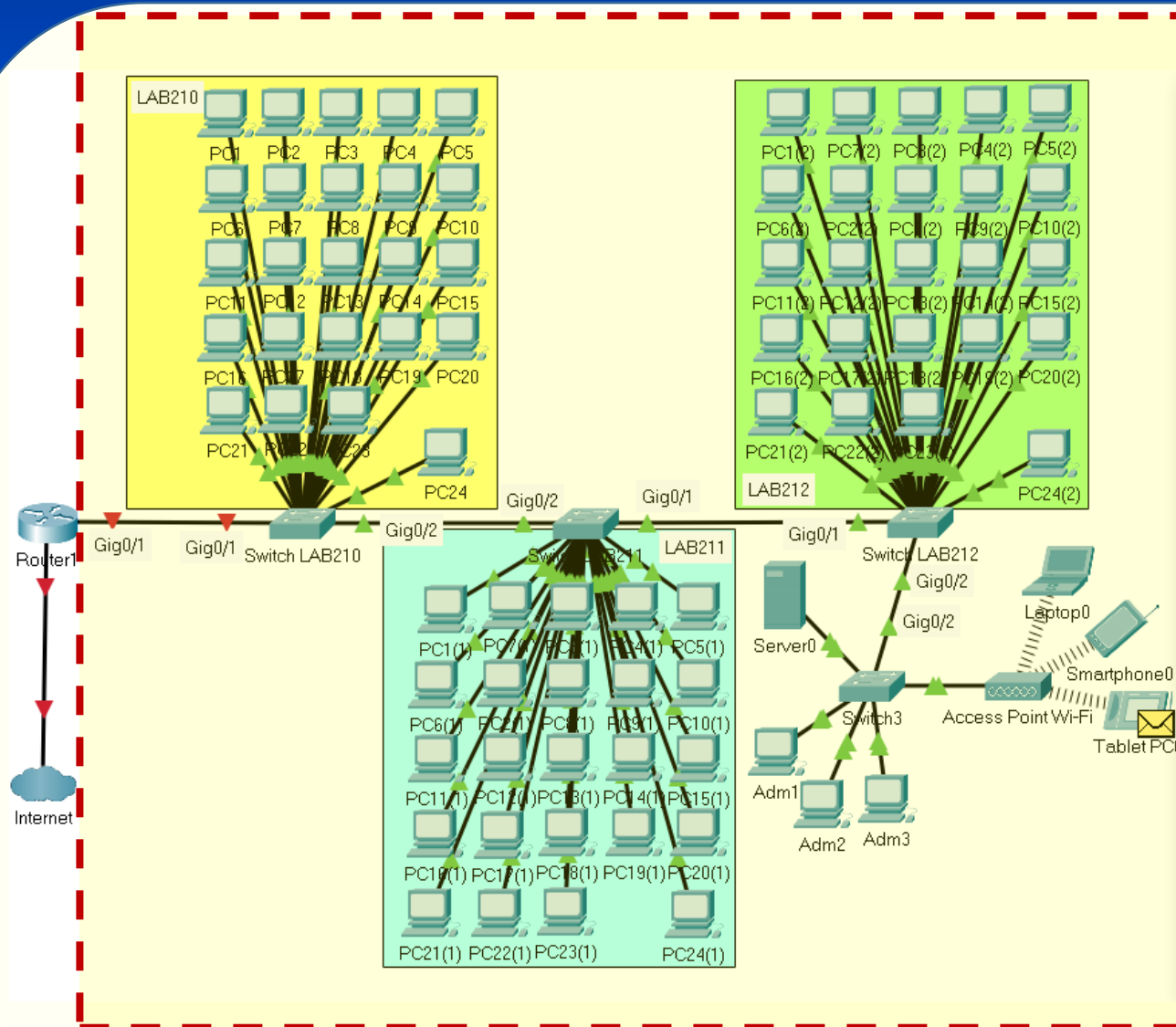


Problemas a considerar:

Desempenho: Todos os dispositivos serão impactados por broadcasts gerados na rede local

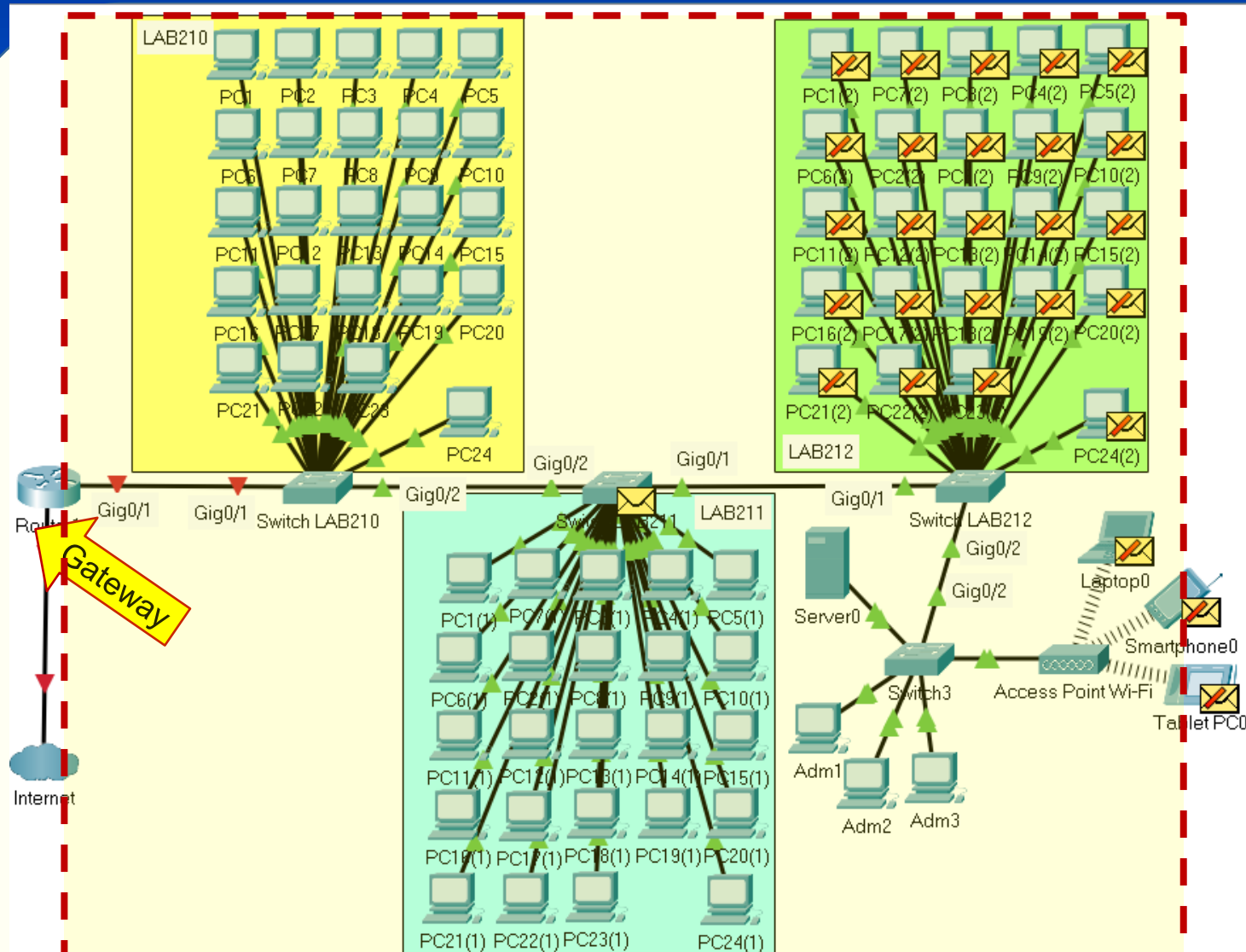
Segurança: Todos os equipamentos conseguem trocar informações uns com os outros sem uma barreira de proteção (*Firewall*) entre eles.

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



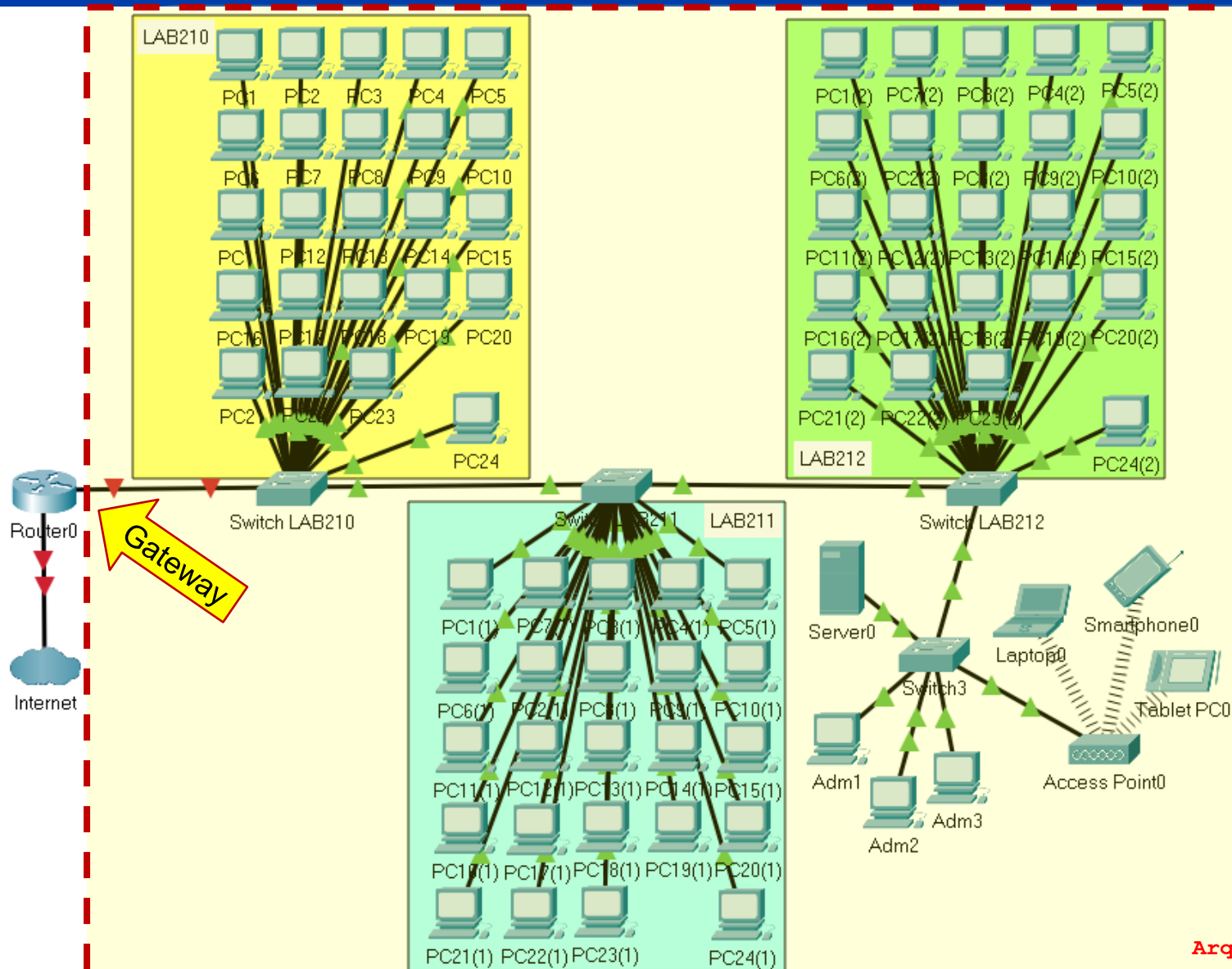
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Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Cenário Proposto: Aula 04 2024 PraticacomSwitcheseVlan Checkpoint.pkt



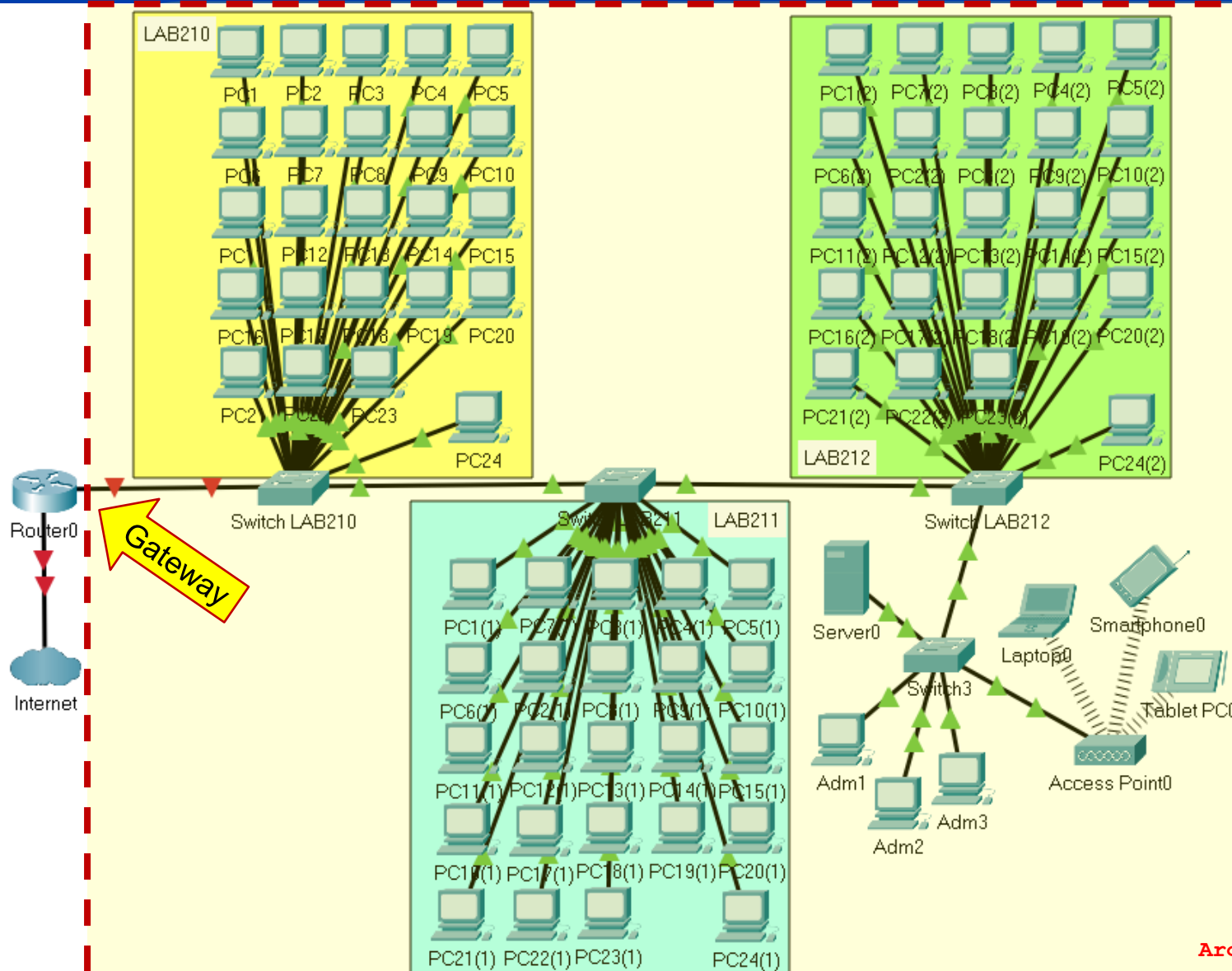
Proposta para divisão em redes Virtuais (VLANs):

- 1 VLAN para cada laboratório: LAB210, LAB211, LAB212
- 1 VLAN para os 3 PCs de professores nos laboratórios
- 1 VLAN para o Servidor
- 1 VLAN para os PCs do Administrativo
- 1 VLAN para a rede Wireless

No total teremos 7 VLANs, ou seja:

- 7 redes
- 7 domínios de broadcast

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



Proposta para divisão em redes Virtuais (VLANs):

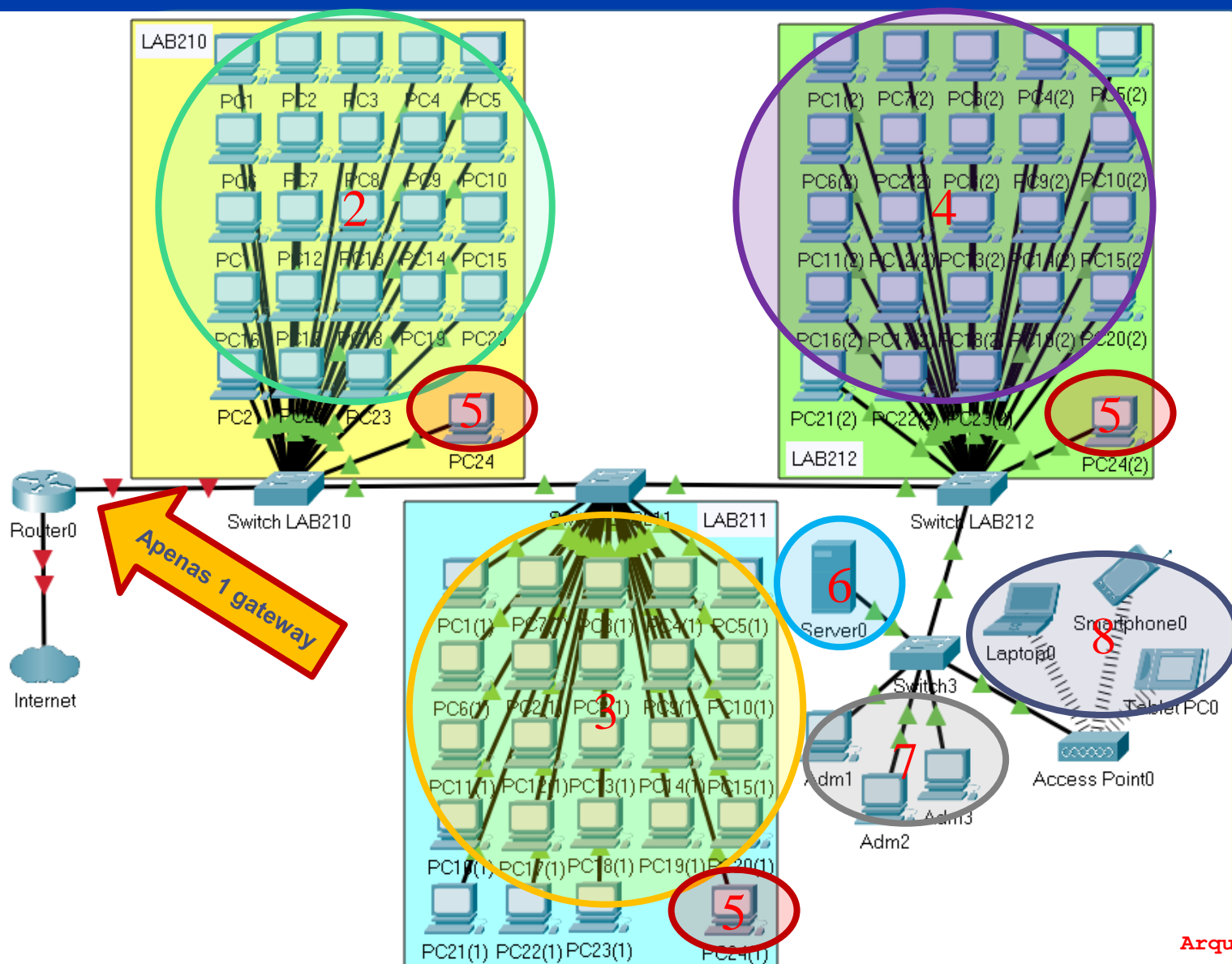
- **VLAN1: DEFAULT** (Por padrão, JÁ EXISTENTE!!!)
- **VLAN2: LAB210**
- **VLAN3: LAB211**
- **VLAN4: LAB212**
- **VLAN5: PROFE**
- **VLAN6: SERVER**
- **VLAN7: ADM**
- **VLAN8: WIFI**

No total serão configuradas 7 VLANs, ou seja:

- 7 redes
- 7 domínios de broadcast

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Cenário Proposto: Aula 05 2024 PraticacomSwitcheseVlan Checkpoint.pkt



Proposta para divisão em redes Virtuais (VLANs):

- **VLAN1: DEFAULT** (Por padrão, JÁ EXISTENTE!!!)
- **VLAN2: LAB210**
- **VLAN3: LAB211**
- **VLAN4: LAB212**
- **VLAN5: PROFE**
- **VLAN6: SERVER**
- **VLAN7: ADM**
- **VLAN8: WIFI**
- **Vlan99: Native (VLAN de gerência)**

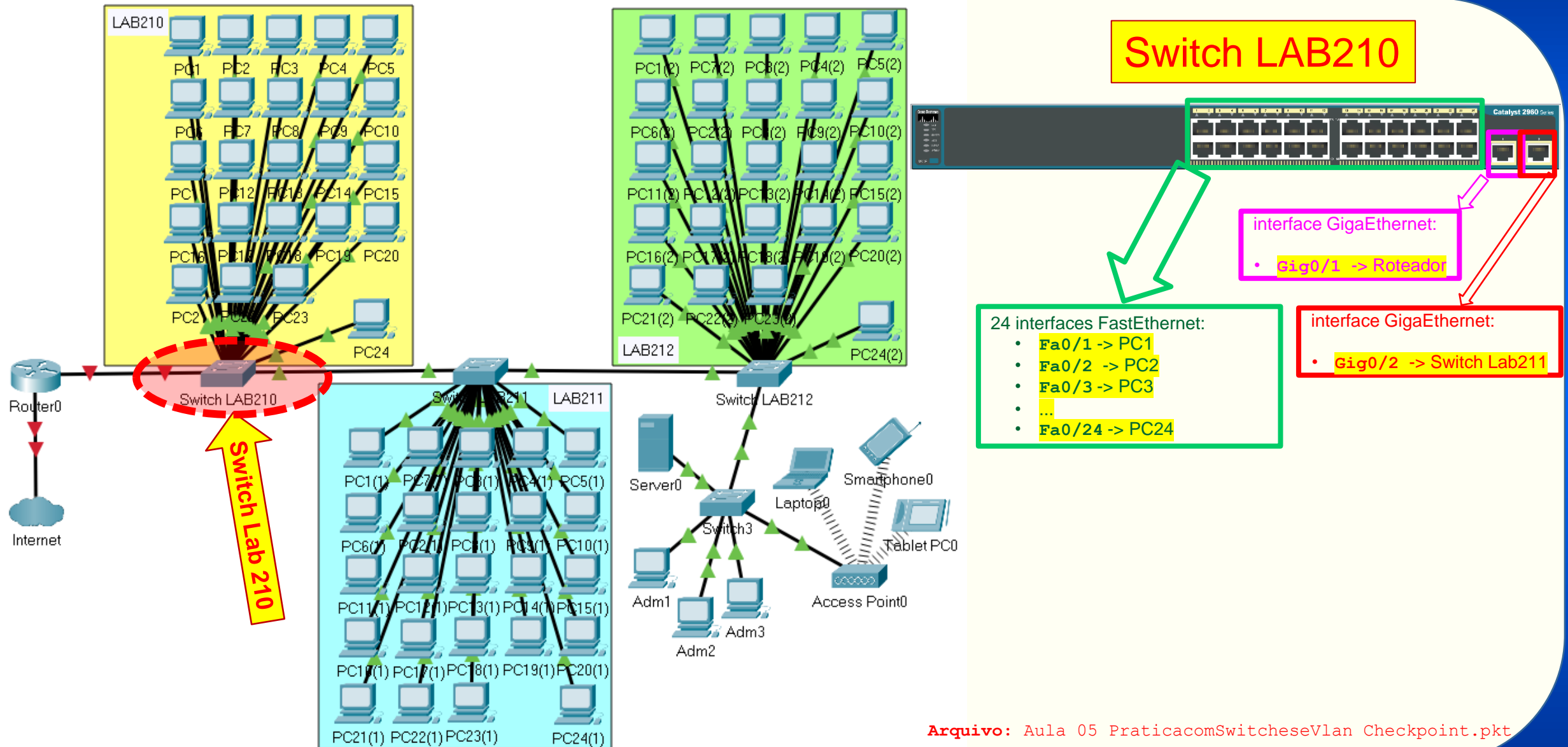
No total serão configuradas 7 VLANs a divisão em:

- 7 redes
- 7 domínios de broadcast

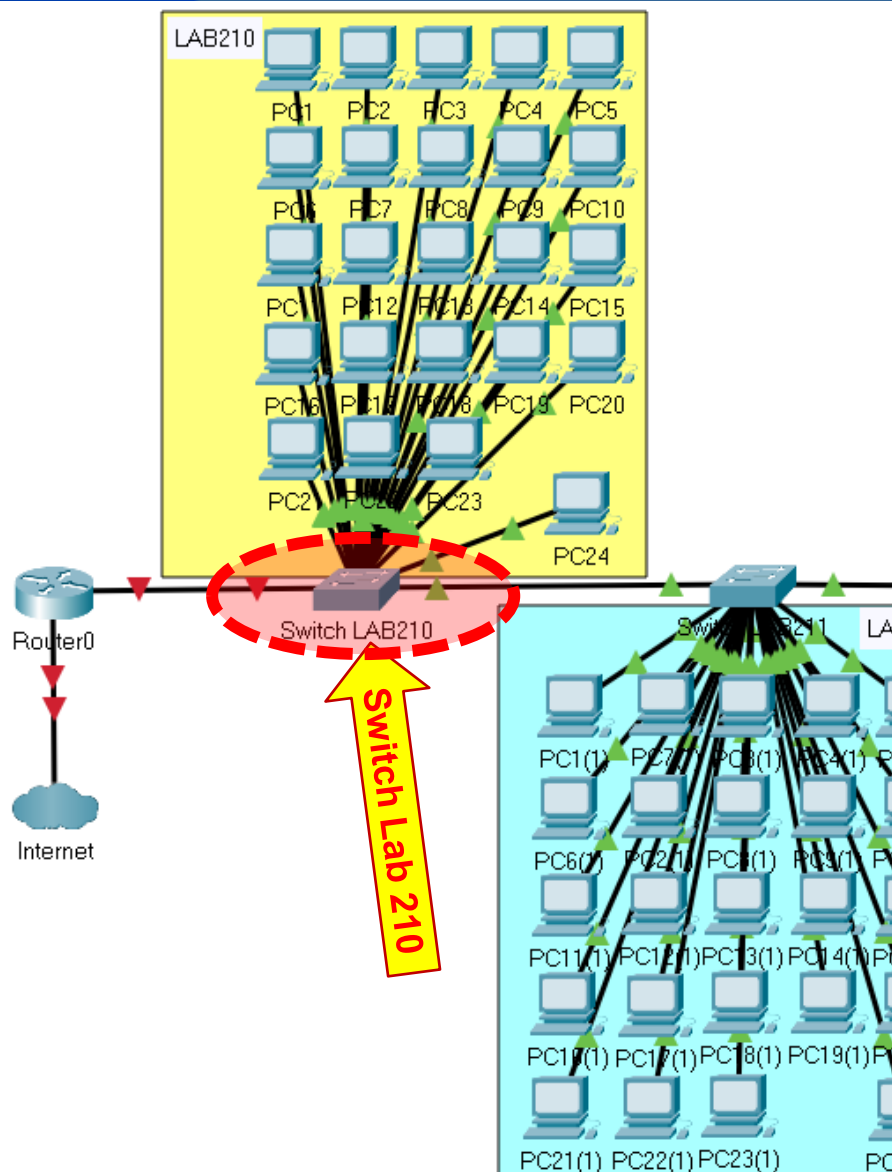
Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Switch LAB210

Análise 1: Switch LAB210



Análise 2: Switch LAB210



Switch LAB210

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Switch>
Switch>
Switch>enable
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

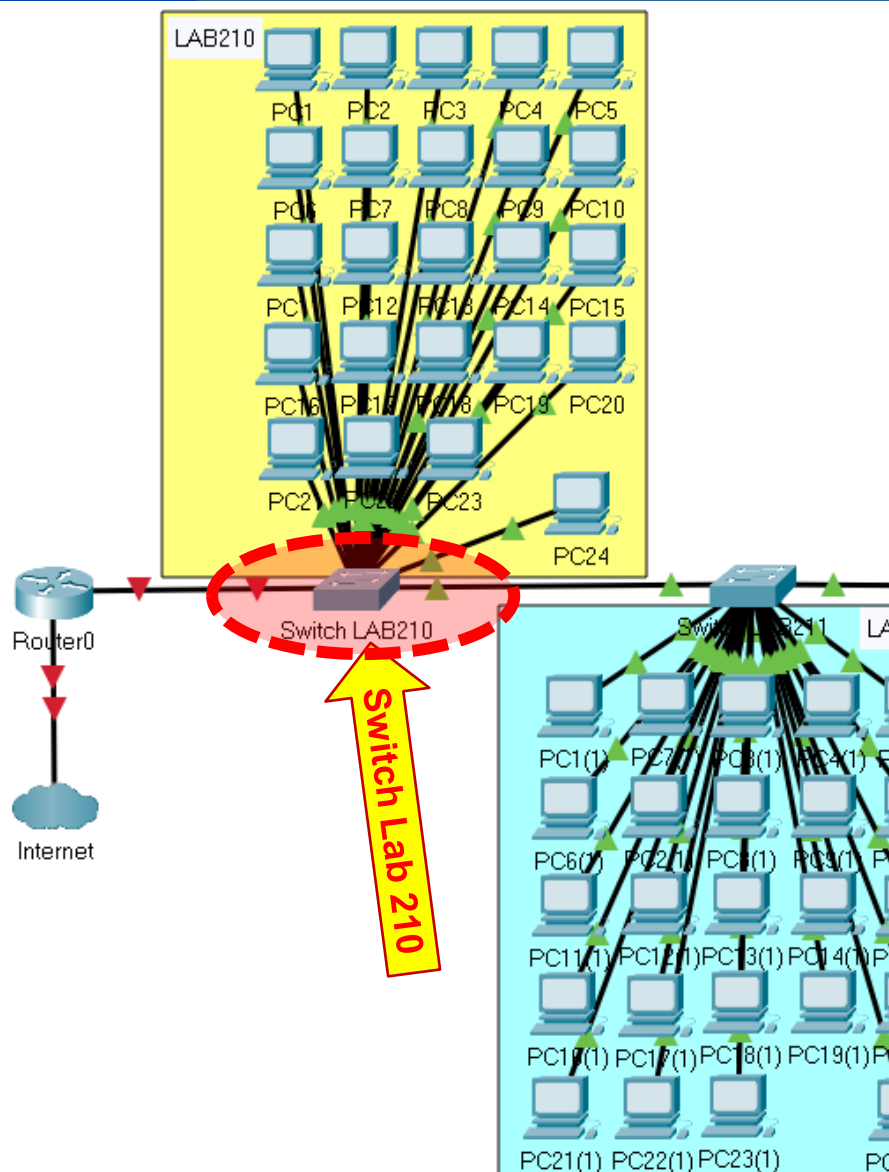
VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

--More--

Ctrl+F6 to exit CLI focus

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Configuração 1: Configurar VLANs no Switch LAB210



Switch LAB210

Physical Config CLI Attributes

IOS Command Line Interface

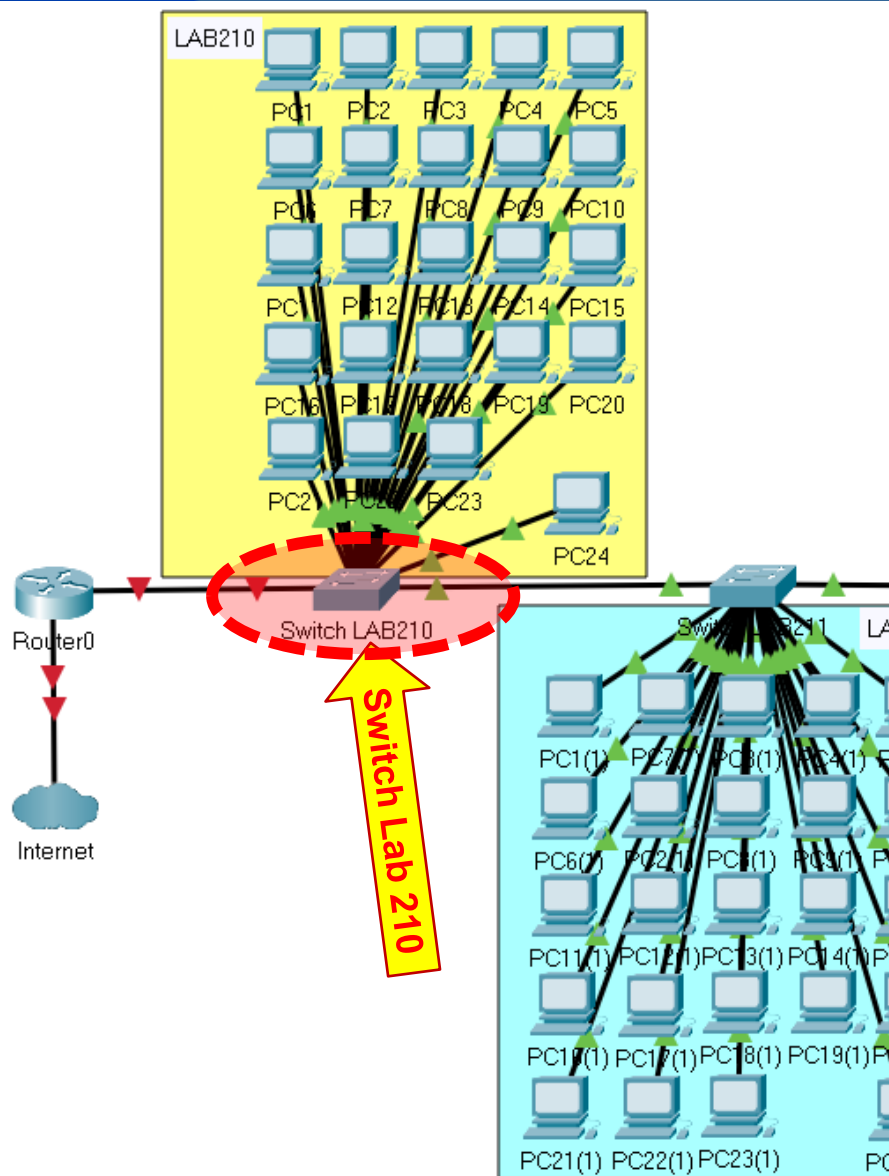
```
Switch#
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 2
Switch(config-vlan)#name lab210
Switch(config-vlan)#
Switch(config-vlan)#vlan 3
Switch(config-vlan)#name lab211
Switch(config-vlan)#
Switch(config-vlan)#vlan 4
Switch(config-vlan)#name lab212
Switch(config-vlan)#
Switch(config-vlan)#vlan 5
Switch(config-vlan)#name profe
Switch(config-vlan)#
Switch(config-vlan)#vlan 6
Switch(config-vlan)#name server
Switch(config-vlan)#
Switch(config-vlan)#vlan 7
Switch(config-vlan)#name ADM
Switch(config-vlan)#
Switch(config-vlan)#vlan 8
Switch(config-vlan)#name wifi
Switch(config-vlan)#
Switch(config-vlan)#vlan 99
Switch(config-vlan)#name native
Switch(config-vlan)#
```

Ctrl+F6 to exit CLI focus

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Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 3: Switch LAB210



Switch LAB210

Physical Config CLI Attributes

IOS Command Line Interface

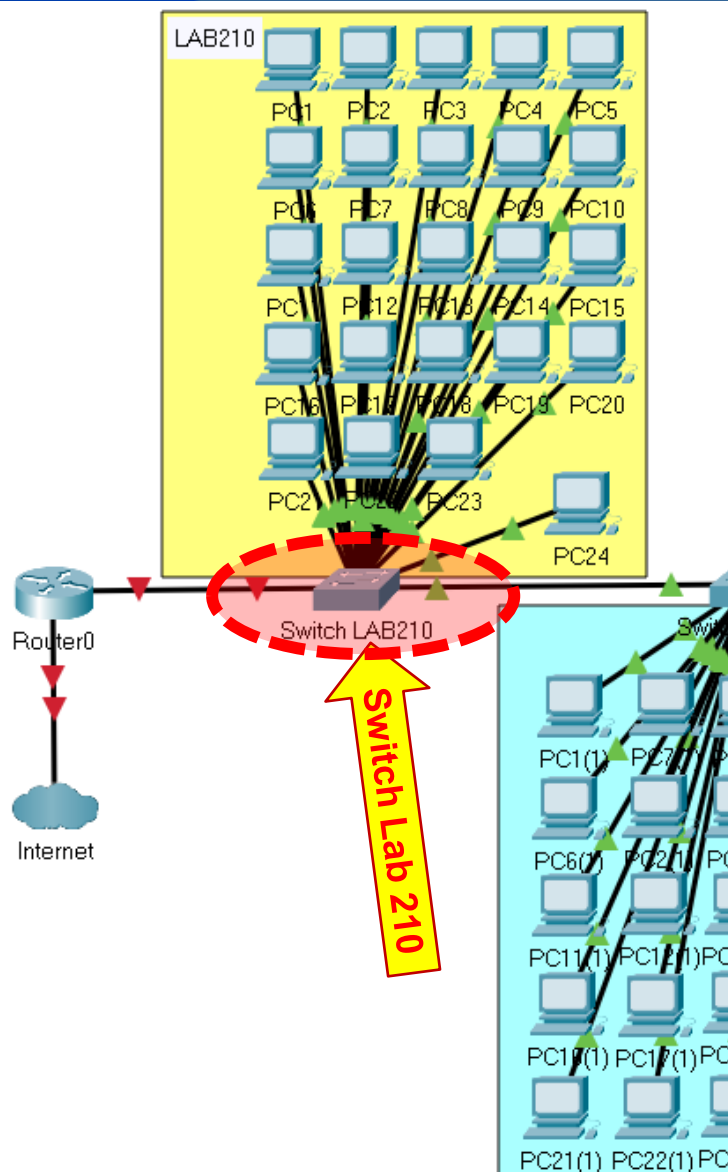
```
Switch#  
%SYS-5-CONFIG_I: Configured from console by console  
  
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
2	lab210	active	
3	lab211	active	
4	lab212	active	
5	profe	active	
6	server	active	
7	ADM	active	
8	wifi	active	
99	native	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	
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Configuração 2: Configurar interfaces no Switch LAB210



Switch LAB210

Physical Config **CLI** Attributes

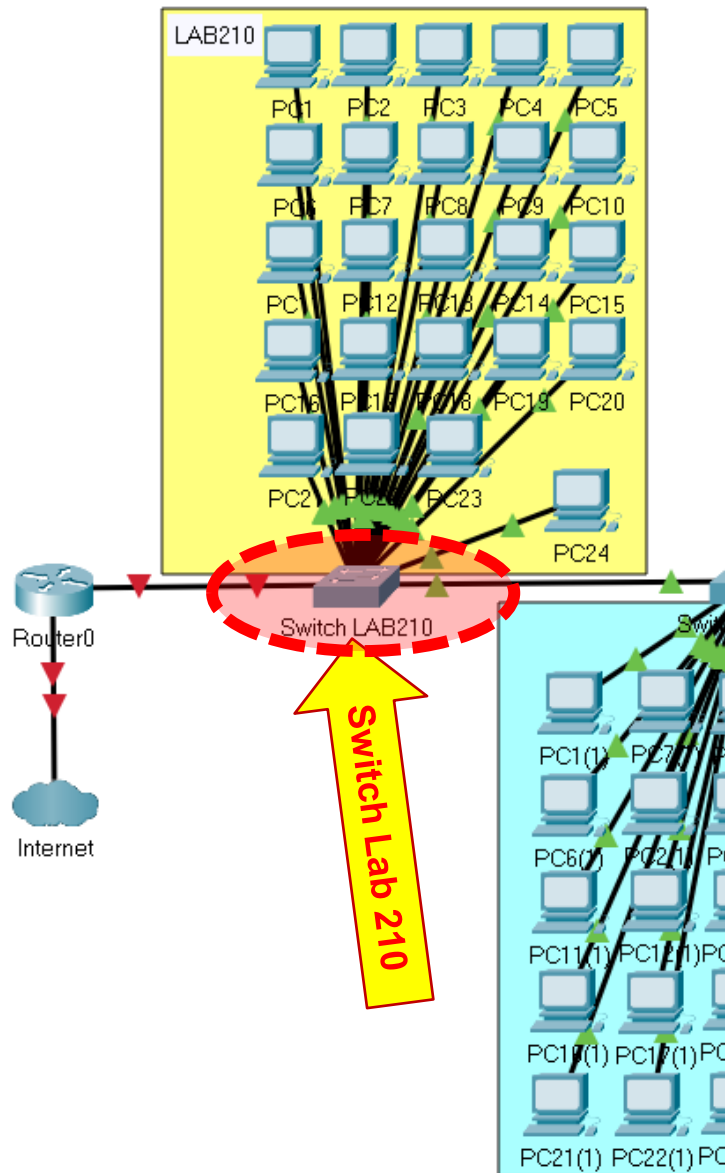
IOS Command Line Interface

```
Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#interface range fa0/1-23
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 2
Switch(config-if-range)#
Switch(config-if-range)#interface fa0/24
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 5
Switch(config-if)#^Z
Switch#
```

Ctrl+F6 to exit CLI focus

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Análise 3: Switch LAB210



Switch LAB210

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch#  
%SYS-5-CONFIG_I: Configured from console by console  
^Z  
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Gig0/1, Gig0/2
2	lab210	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23
3	lab211	active	
4	lab212	active	
5	profe	active	
6	server	active	Fa0/24
7	ADM	active	
8	wifi	active	
99	native	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

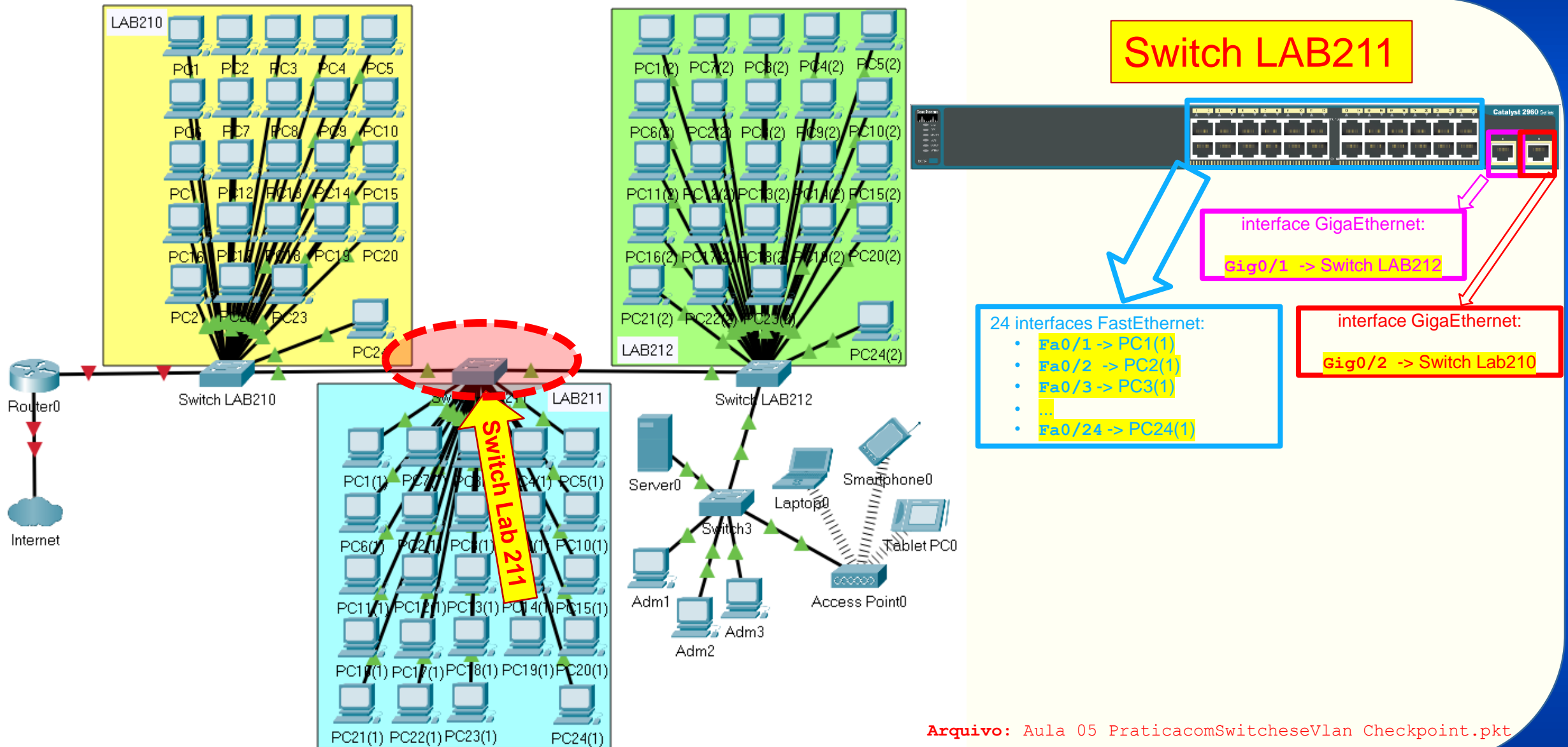
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Ctrl+F6 to exit CLI focus

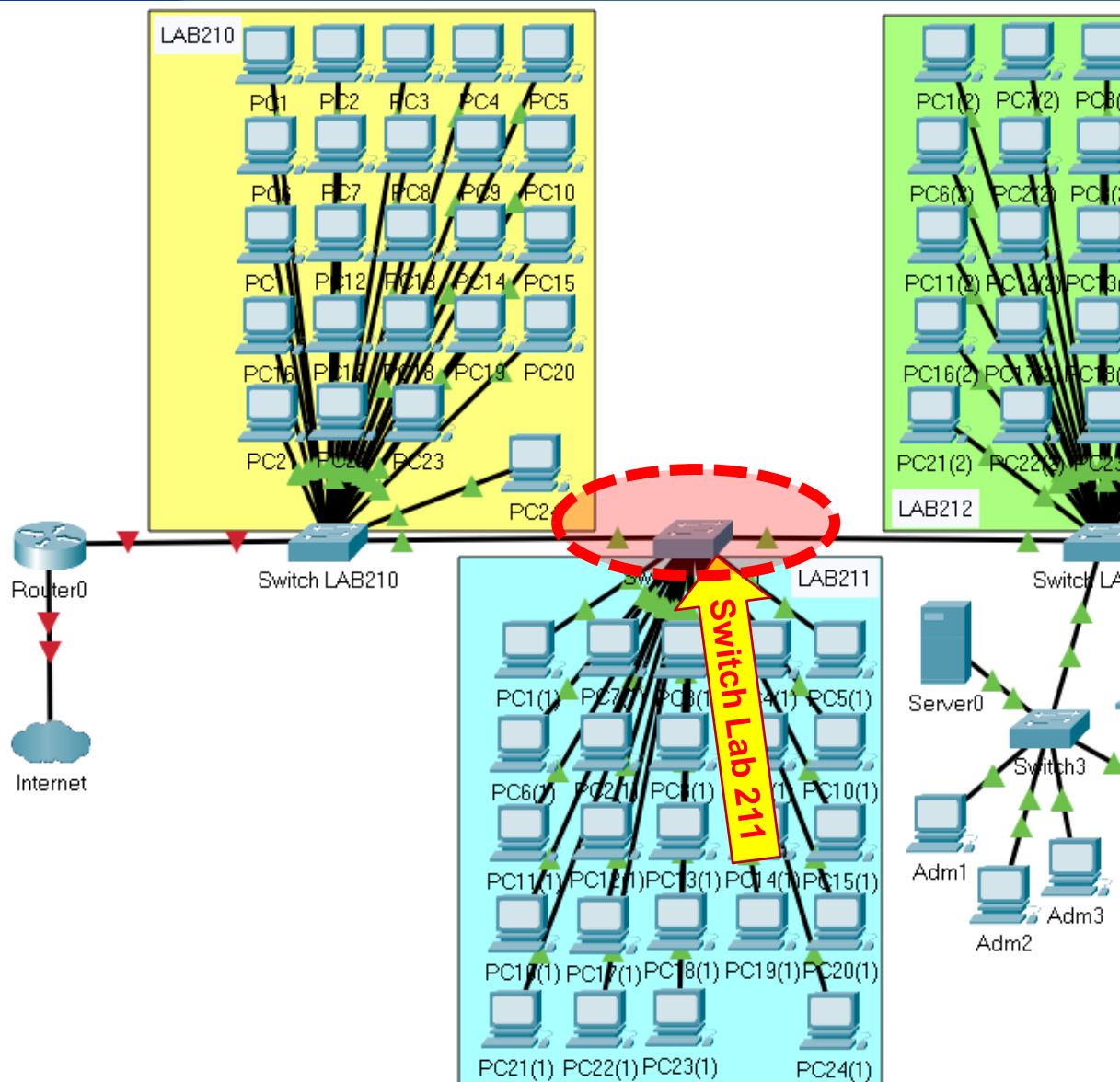
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Switch LAB211

Análise 1: Switch LAB211



Configuração 2: Configurar VLANs no Switch LAB211



Switch LAB211

Physical Config **CLI** Attribute

IOS Command Line Interface

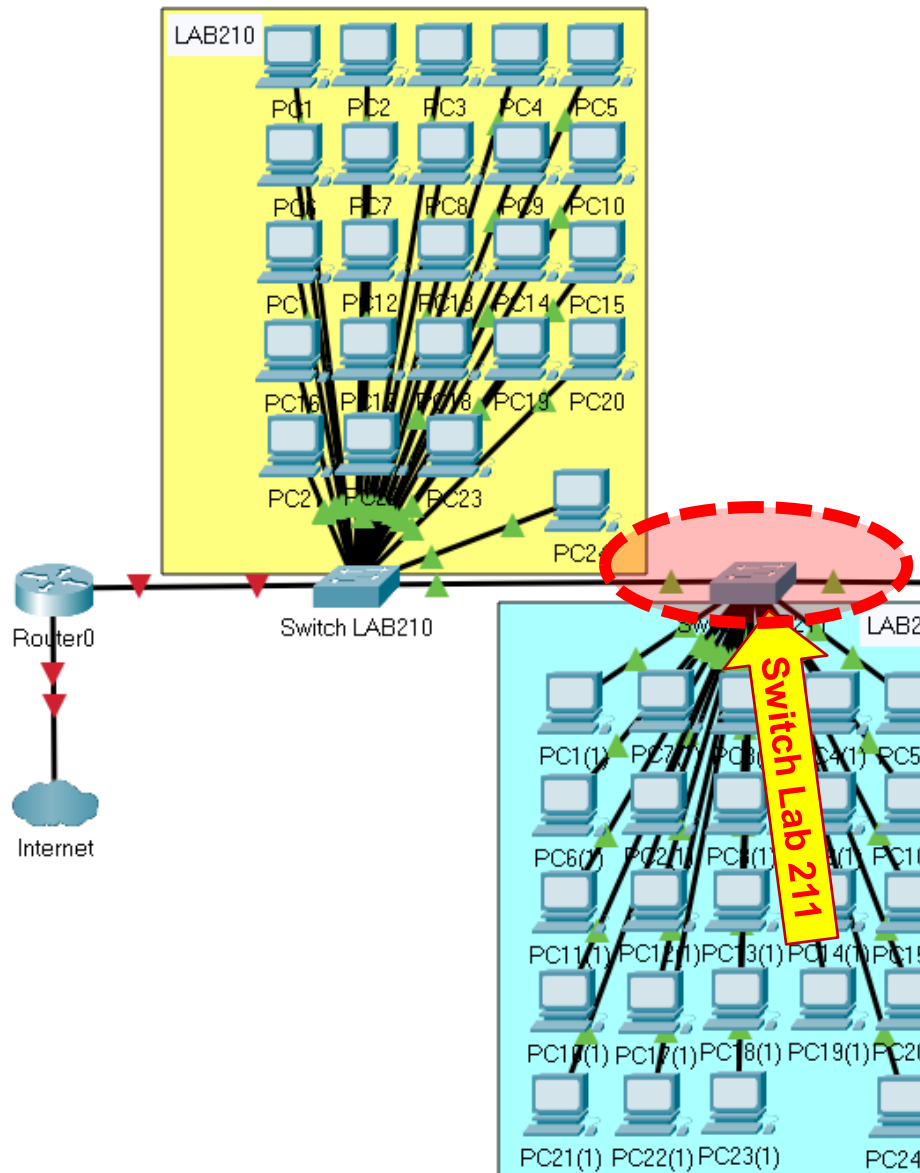
```
Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 2
Switch(config-vlan)#name lab210
Switch(config-vlan)#
Switch(config-vlan)#vlan 3
Switch(config-vlan)#name lab211
Switch(config-vlan)#
Switch(config-vlan)#vlan 4
Switch(config-vlan)#name lab212
Switch(config-vlan)#
Switch(config-vlan)#vlan 5
Switch(config-vlan)#name profe
Switch(config-vlan)#
Switch(config-vlan)#vlan 6
Switch(config-vlan)#name server
Switch(config-vlan)#
Switch(config-vlan)#vlan 7
Switch(config-vlan)#name adm
Switch(config-vlan)#
Switch(config-vlan)#vlan 8
Switch(config-vlan)#name wifi
Switch(config-vlan)#
Switch(config-vlan)#vlan 99
Switch(config-vlan)#name native
```

Ctrl+F6 to exit CLI focus

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Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 2: Switch LAB211



Switch LAB211

Physical Config **CLI** Attributes

IOS Command Line Interface

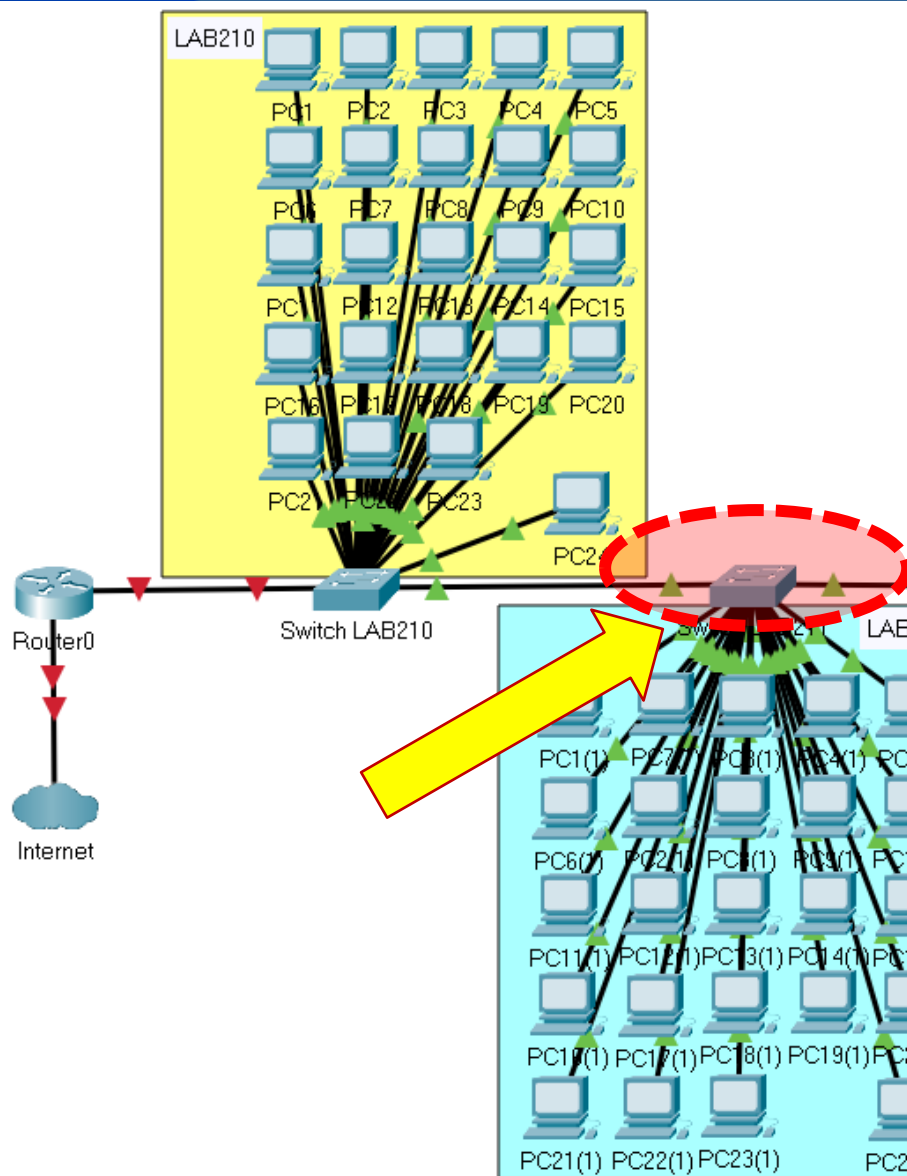
```
Switch#
Switch#
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
2	lab210	active	
3	lab211	active	
4	lab212	active	
5	profe	active	
6	server	active	
7	adm	active	
8	wifi	active	
99	native	active	
1002	fdci-default	active	
1003	token-ring-default	active	
1004	fdnet-default	active	
1005	trnet-default	active	
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Ctrl+F6 to exit CLI focus

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Configuração 2: Configurar interfaces no Switch LAB211



Switch LAB211

Physical Config **CLI** Attributes

Switch LAB211

IOS Command Line Interface

Press RETURN to get started.

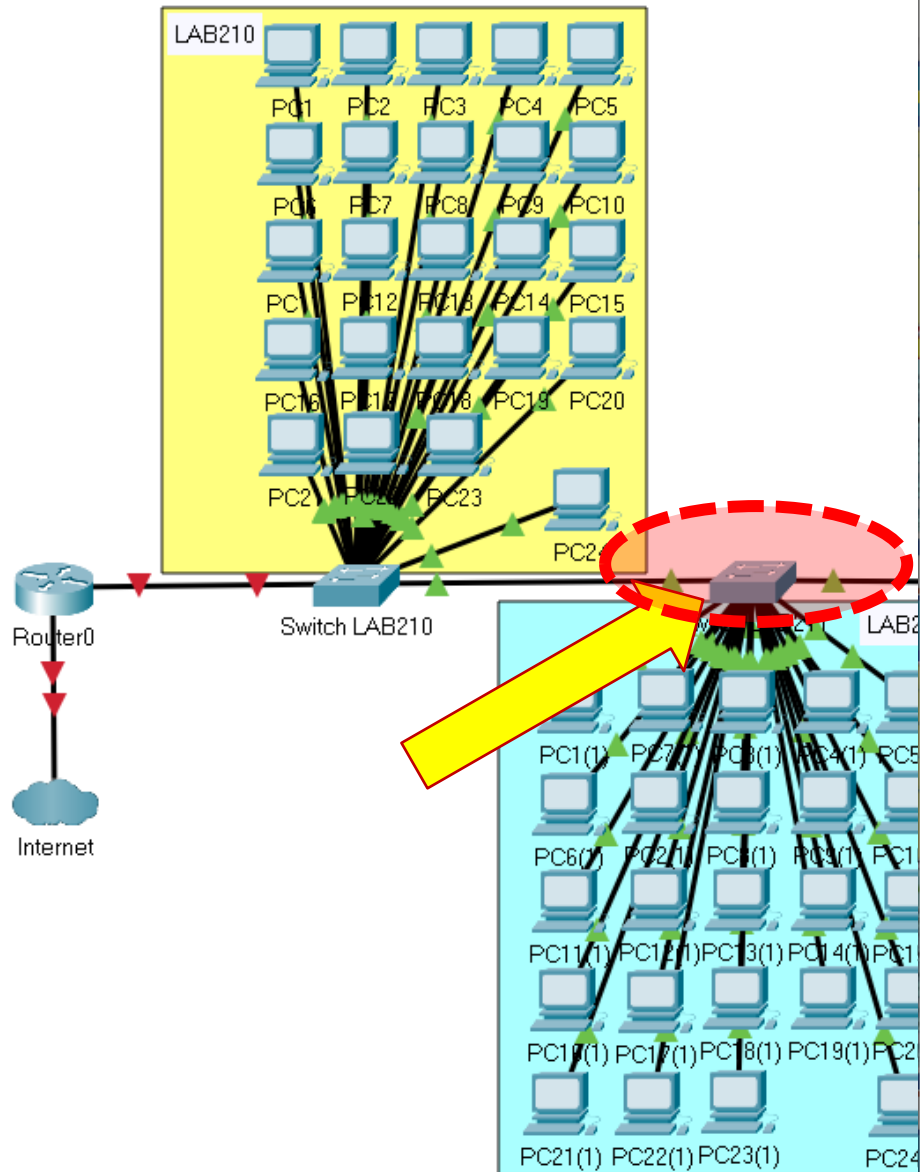
```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#interface range fa0/1-23
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 3
Switch(config-if-range)#
Switch(config-if-range)#interface fa0/24
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 5
Switch(config-if)#
```

Ctrl+F6 to exit CLI focus

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Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 3: Switch LAB211



Switch LAB211

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch#  
%SYS-5-CONFIG_I: Configured from console by console  
  
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Gig0/1, Gig0/2
2	lab210	active	
3	lab211	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23
4	lab212	active	
5	profe	active	Fa0/24
6	server	active	
7	adm	active	
8	wifi	active	
99	native	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

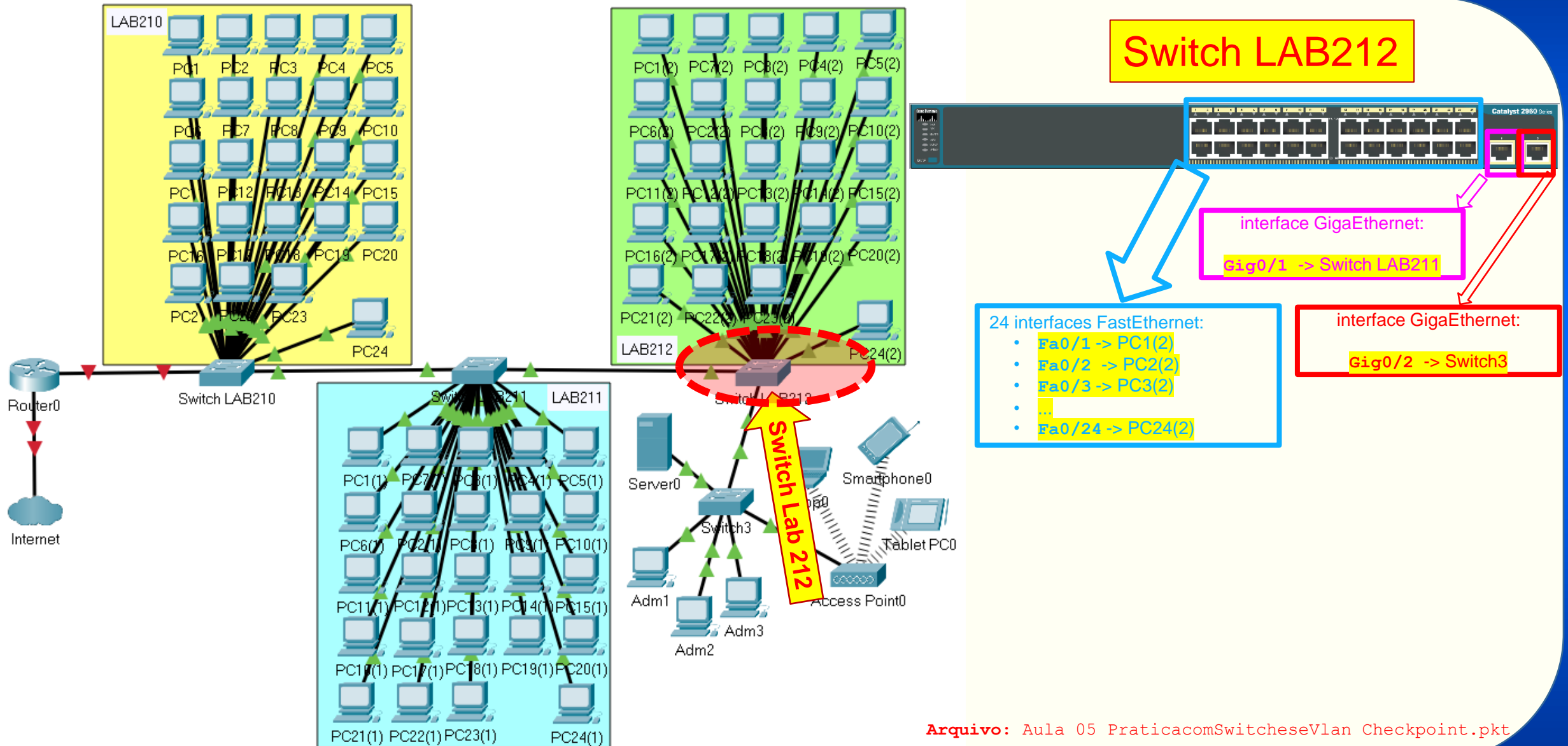
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Ctrl+F6 to exit CLI focus

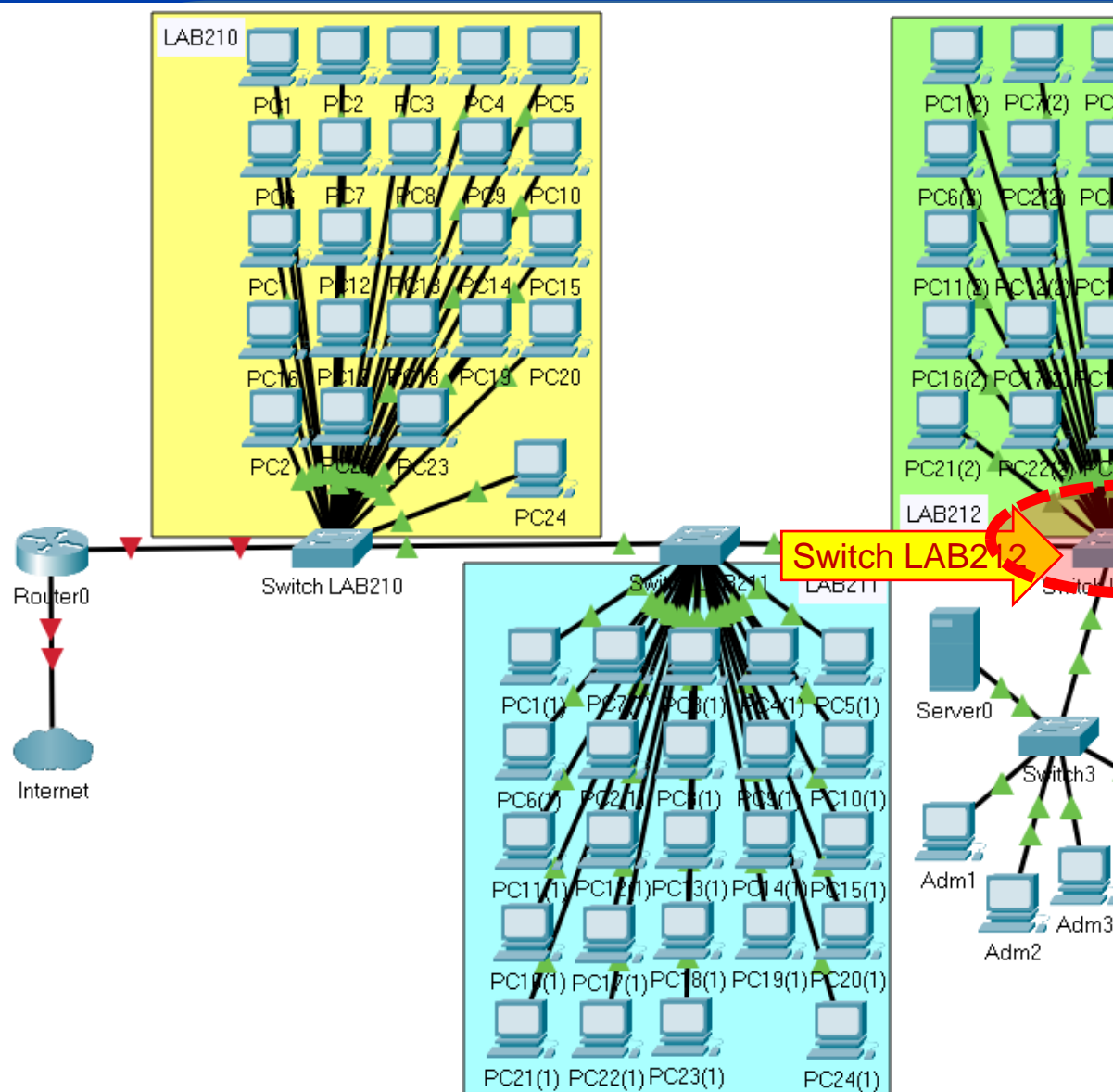
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Switch LAB212

Análise 1: Switch LAB212



Configuração 3: Configurar VLANs no Switch LAB212



Switch LAB212

Physical Config CLI Attributes

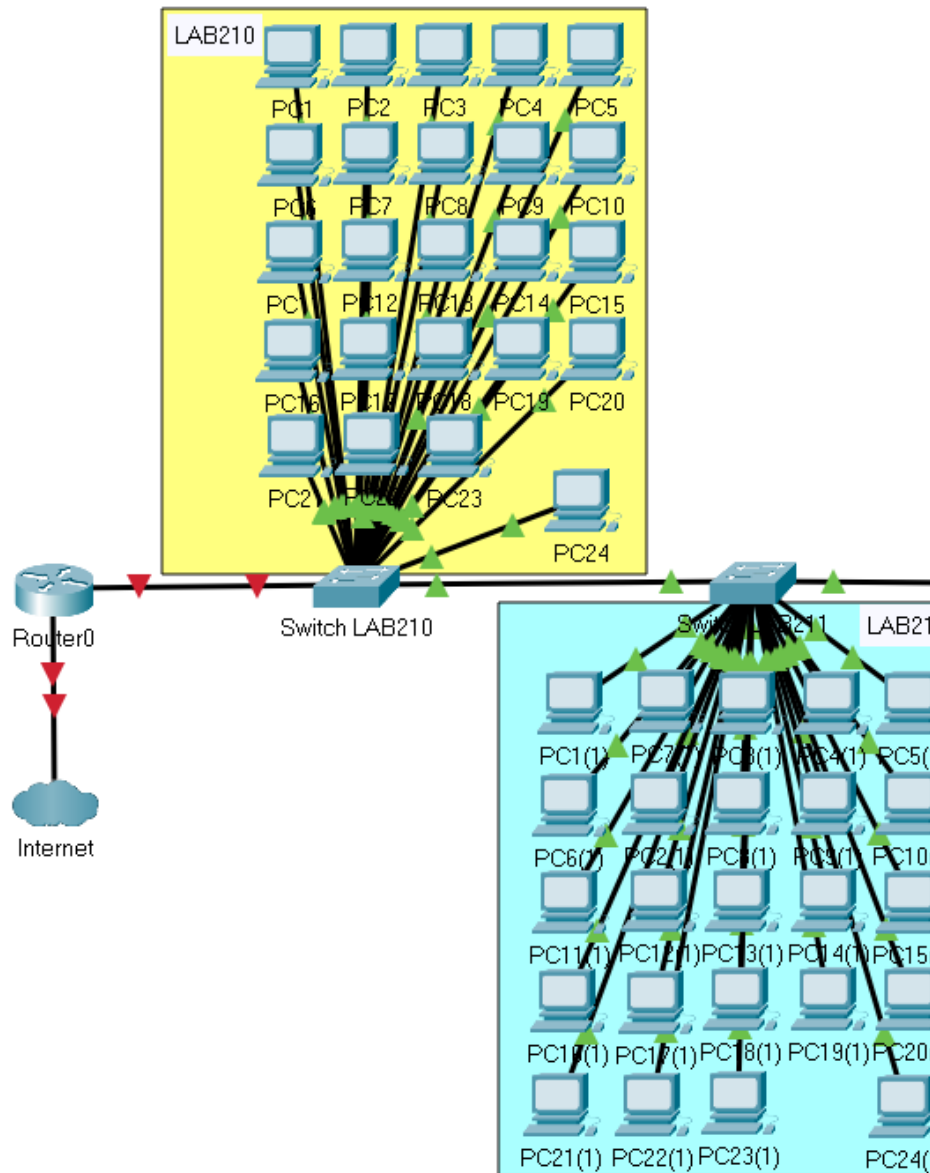
IOS Command Line Interface

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#vlan 2
Switch(config-vlan)#name lab210
Switch(config-vlan)#
Switch(config-vlan)#vlan 3
Switch(config-vlan)#name lab211
Switch(config-vlan)#
Switch(config-vlan)#vlan 4
Switch(config-vlan)#name lab212
Switch(config-vlan)#
Switch(config-vlan)#vlan 5
Switch(config-vlan)#name profe
Switch(config-vlan)#
Switch(config-vlan)#vlan 6
Switch(config-vlan)#name server
Switch(config-vlan)#
Switch(config-vlan)#vlan 7
Switch(config-vlan)#name ADM
Switch(config-vlan)#
Switch(config-vlan)#vlan 8
Switch(config-vlan)#name wifi
Switch(config-vlan)#
Switch(config-vlan)#vlan 99
Switch(config-vlan)#name native
```

Ctrl+F6 to exit CLI focus

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Análise 2: Switch LAB212



Switch LAB212

Physical Config CLI Attributes

IOS Command Line Interface

```
%SYS-5-CONFIG_1: Configured from console by console

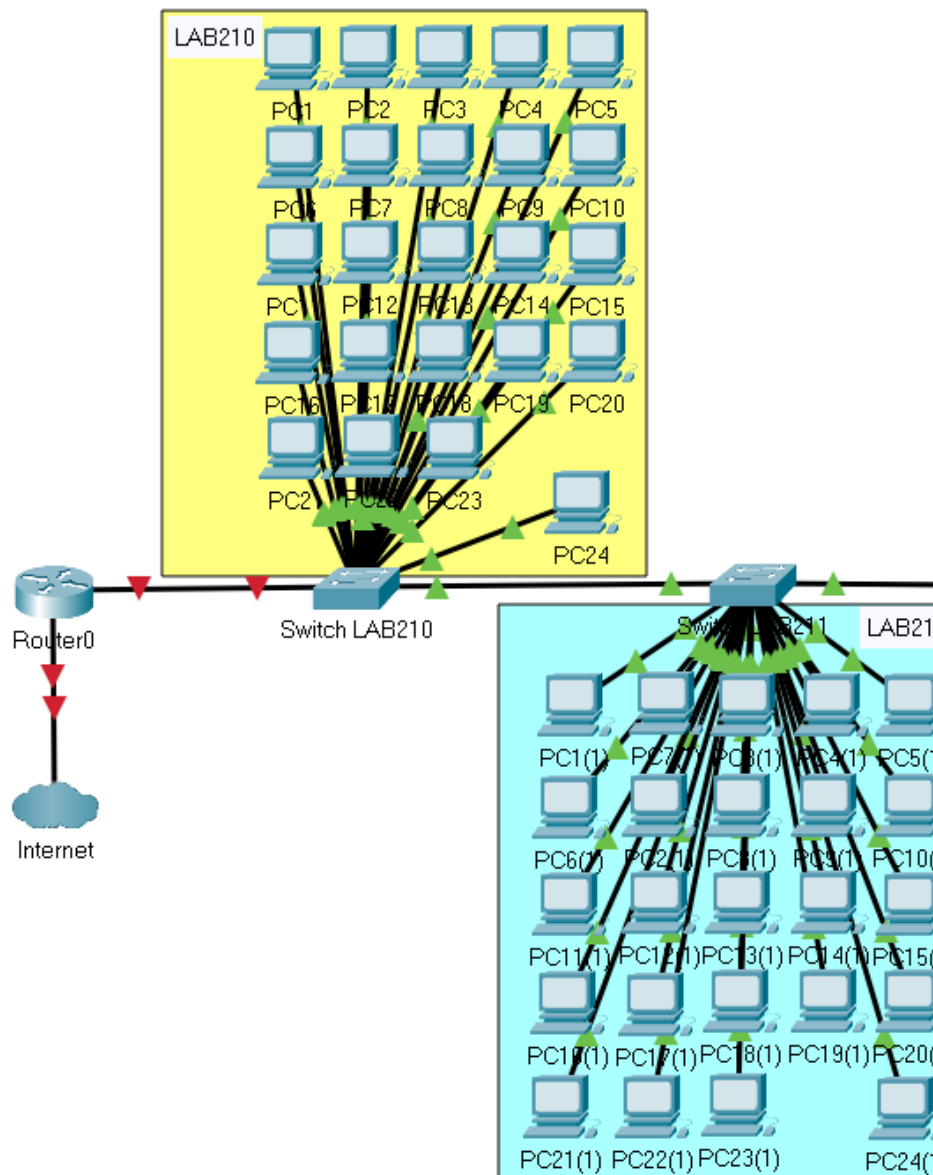
Switch#
Switch#show vlan

VLAN Name                Status    Ports
----
1    default                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                           Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                           Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                           Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                           Gig0/1, Gig0/2
2    lab210                 active
3    lab211                 active
4    lab212                 active
5    profe                  active
6    server                 active
7    ADM                    active
8    wifi                   active
99   native                 active
1002 fddi-default            active
1003 token-ring-default    active
1004 fddinet-default        active
1005 trnet-default          active
--More--
```

Ctrl+F6 to exit CLI focus

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Configuração 2: Configurar interfaces no Switch LAB212



Switch LAB212

Physical Config CLI Attributes

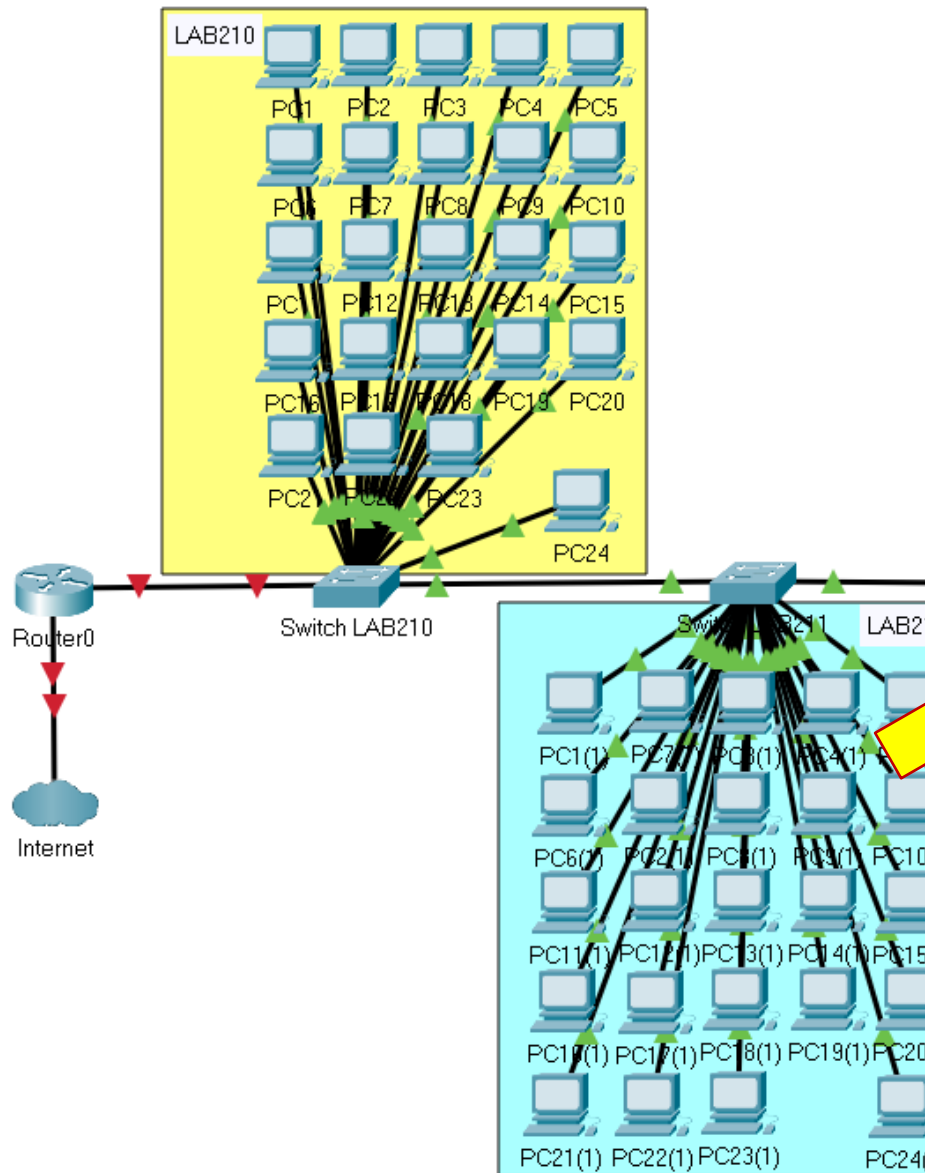
IOS Command Line Interface

```
Switch>
Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#interface range fa0/1-23
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 4
Switch(config-if-range)#
Switch(config-if-range)#interface fa0/24
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 5
Switch(config-if)#
Switch(config-if)#switchport access vlan 5
Switch(config-if)#
```

Ctrl+F6 to exit CLI focus

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Análise 3: Switch LAB212



Switch LAB212

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Switch#
Switch#
Switch#
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Gig0/1, Gig0/2
2	lab210	active	
3	lab211	active	
4	lab212	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23
5	profe	active	Fa0/24
6	server	active	
7	ADM	active	
8	wifi	active	
99	native	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

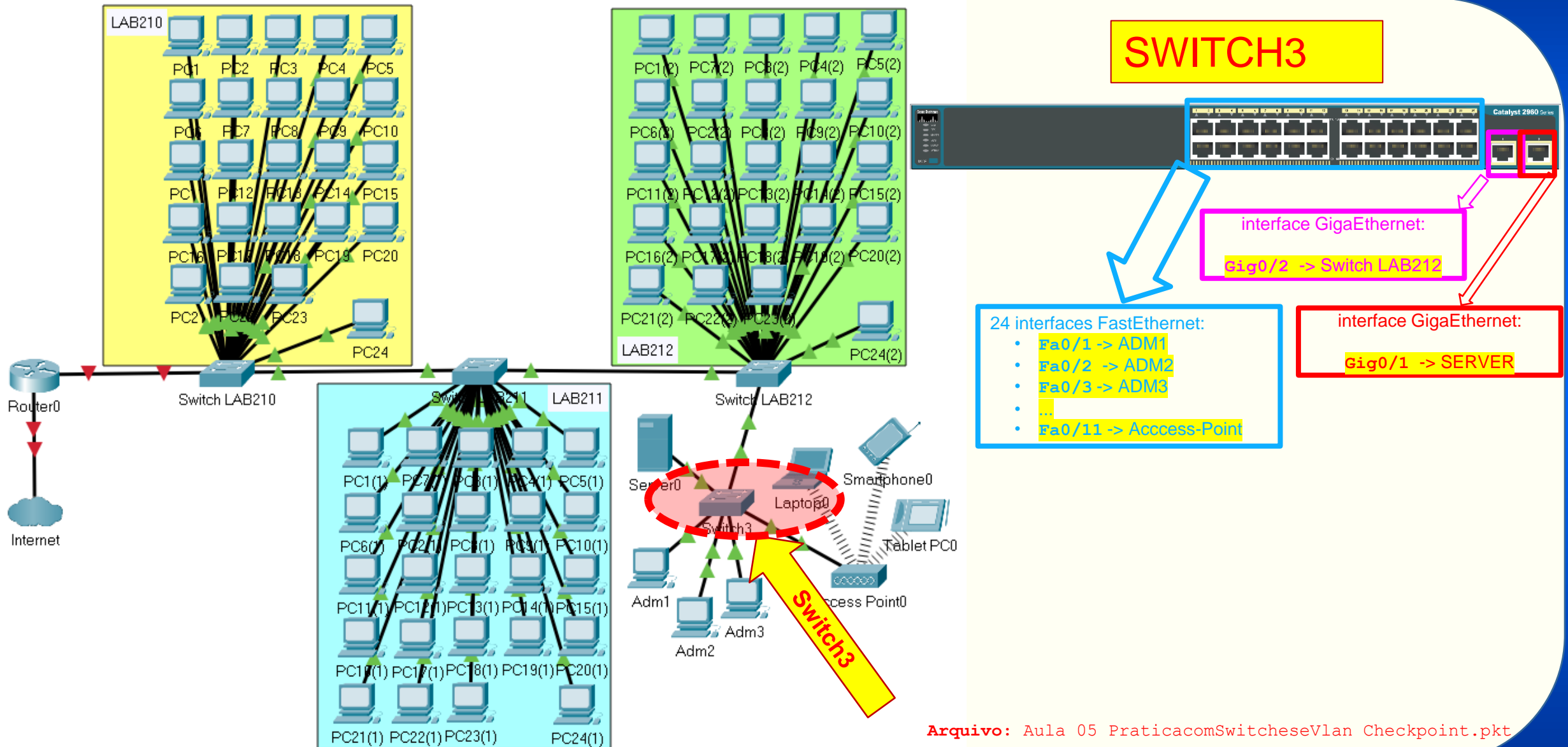
--More--

Ctrl+F6 to exit CLI focus

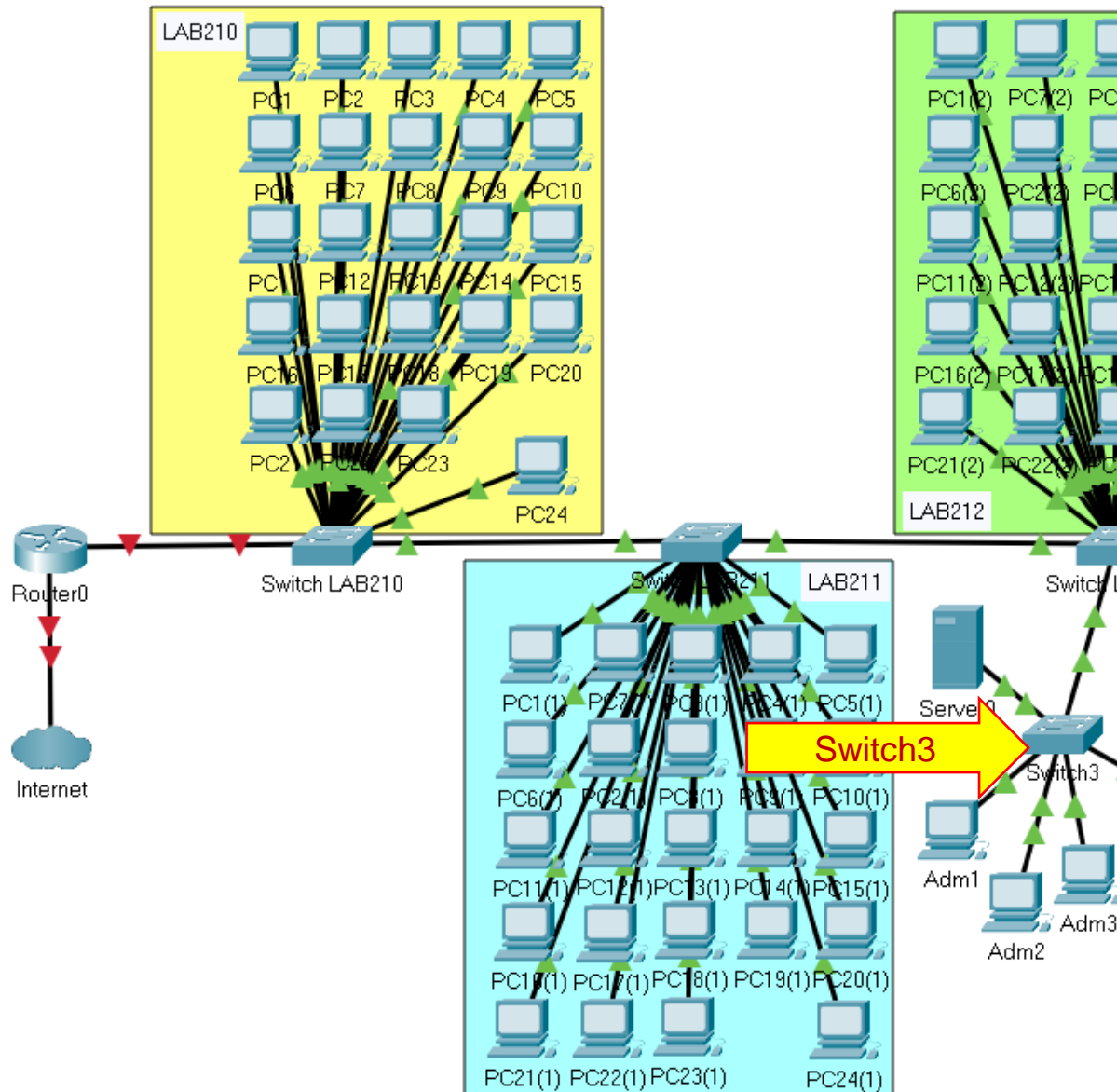
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Switch SWITCH3

Análise 1: Switch Switch3



Configuração 1: Configurar VLANs no Switch **Switch3**



Switch3

Physical Config **CLI** Attributes

Switch3

IOS Command Line Interface

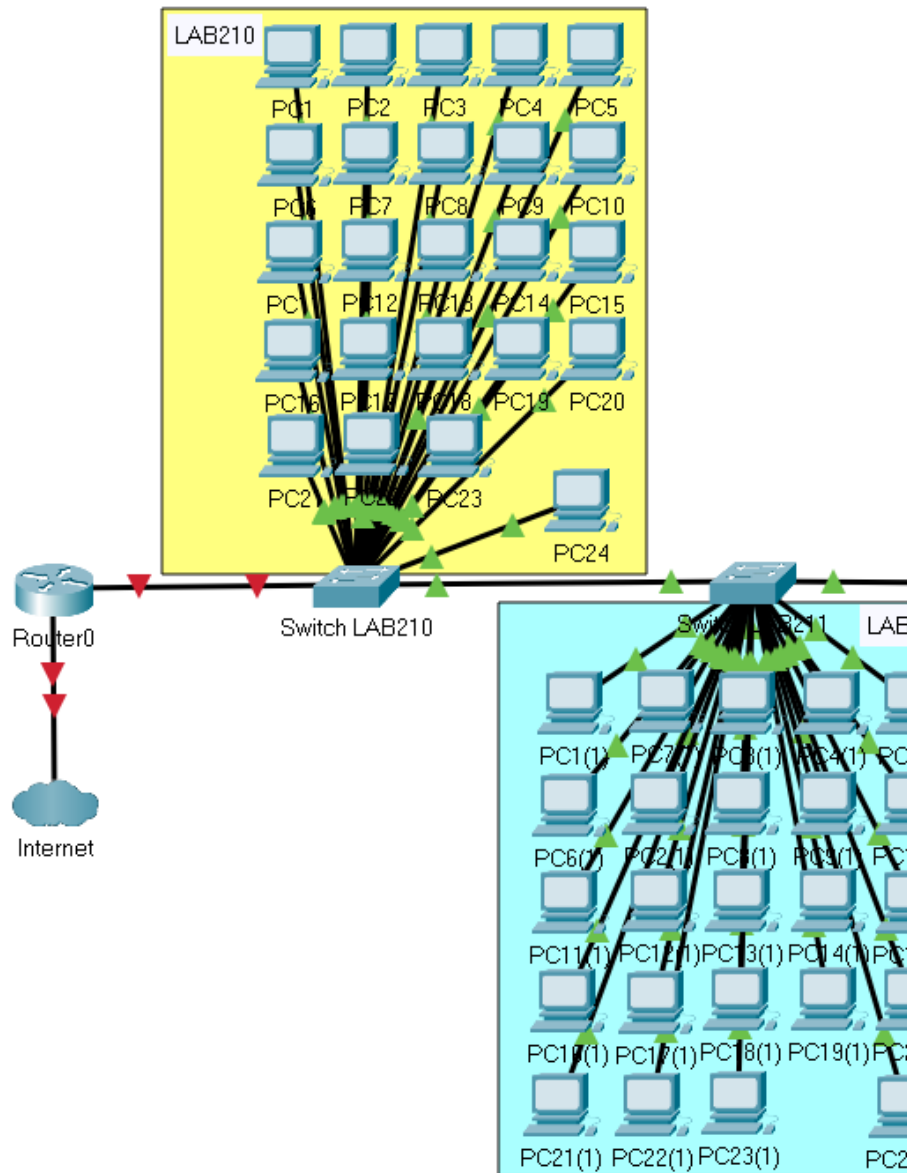
```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#vlan 2
Switch(config-vlan)#name lab210
Switch(config-vlan)#
Switch(config-vlan)#vlan 3
Switch(config-vlan)#name lab211
Switch(config-vlan)#
Switch(config-vlan)#vlan 4
Switch(config-vlan)#name lab212
Switch(config-vlan)#
Switch(config-vlan)#vlan 5
Switch(config-vlan)#name profe
Switch(config-vlan)#
Switch(config-vlan)#vlan 6
Switch(config-vlan)#name server
Switch(config-vlan)#
Switch(config-vlan)#vlan 7
Switch(config-vlan)#name adm
Switch(config-vlan)#
Switch(config-vlan)#vlan 8
Switch(config-vlan)#name wifi
Switch(config-vlan)#
Switch(config-vlan)#vlan 99
Switch(config-vlan)#name native
```

Ctrl+F6 to exit CLI focus

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Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 2: Switch Switch3



Switch3

Switch3

Physical Config CLI Attributes

IOS Command Line Interface

%SYS-5-CONFIG_1: Configured from console by console

Switch#

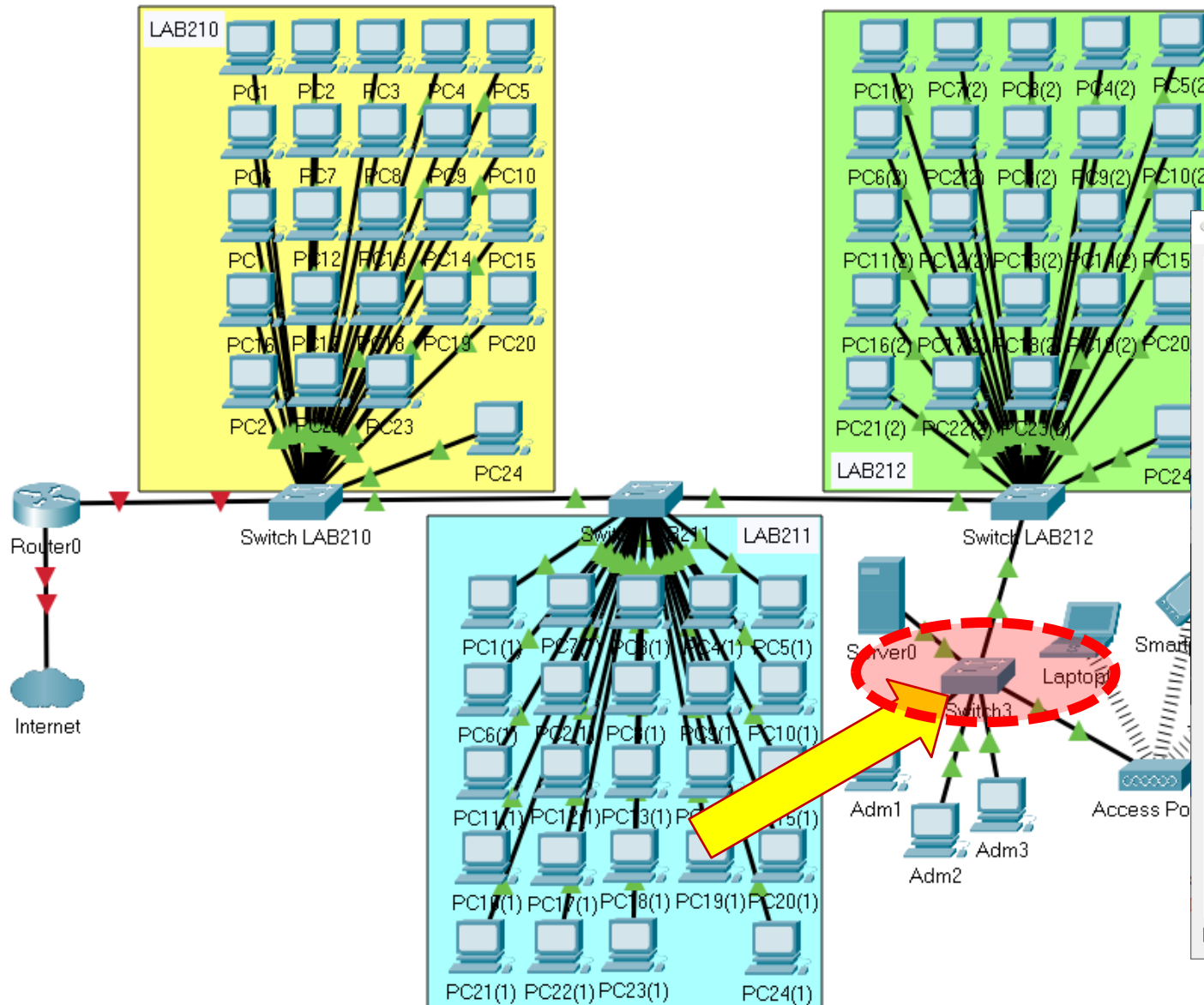
Switch#show vlan

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
2	lab210	active	
3	lab211	active	
4	lab212	active	
5	profe	active	
6	server	active	
7	adm	active	
8	wifi	active	
99	native	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

Ctrl+F6 to exit CLI focus

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Configuração 2: Configurar interfaces no Switch Switch3



Switch3

```
Switch3
Physical Config CLI Attributes
IOS Command Line Interface

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface gig0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 6
Switch(config-if)#
Switch(config-if)#interface range fa0/1-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 7
Switch(config-if-range)#
Switch(config-if-range)#interface fa0/11
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 8
Switch(config-if)#exit
Switch(config)#exit
Switch#
```

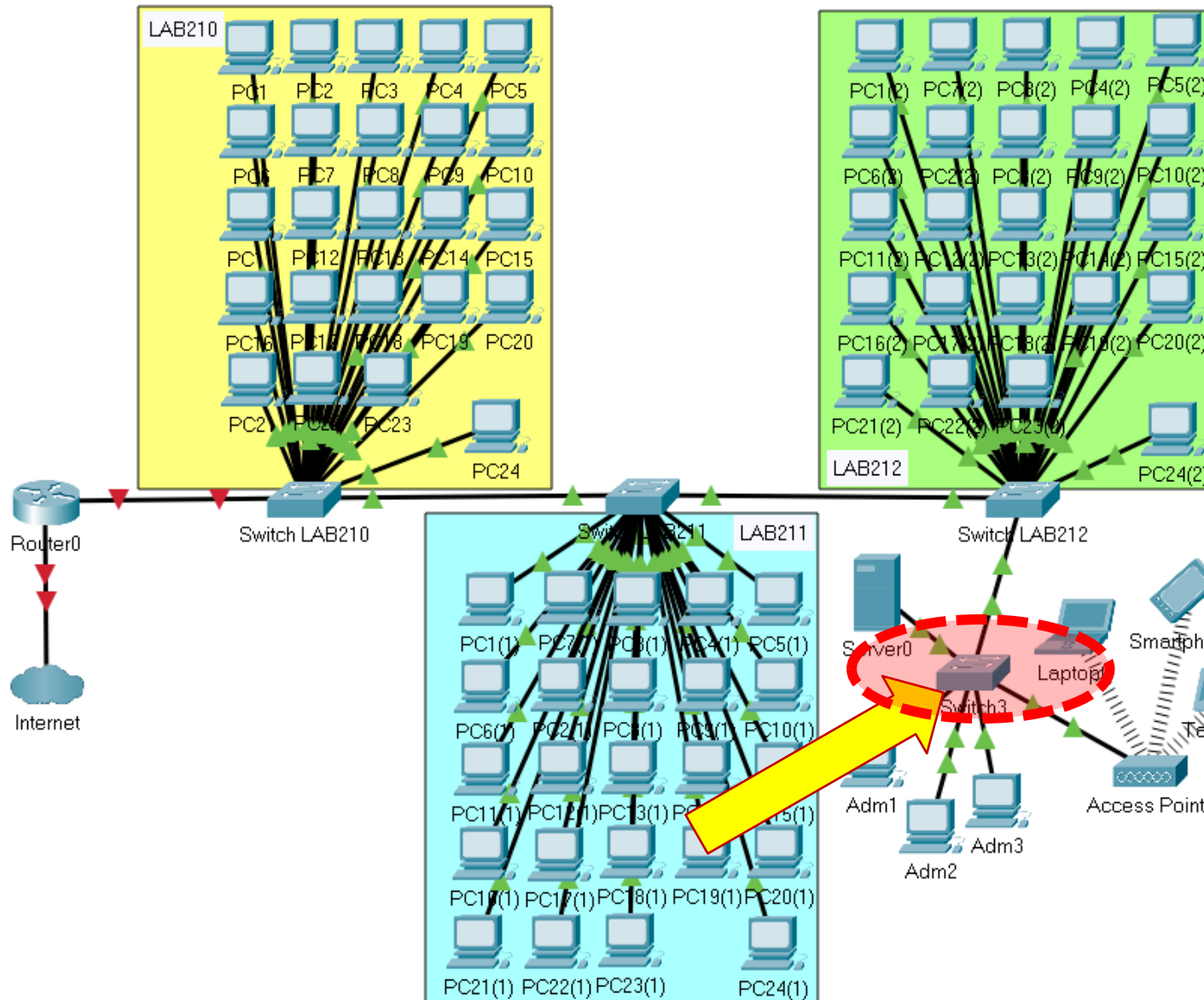
Ctrl+F6 to exit CLI focus

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Top

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 3: Switch Switch3



Switch3

```
Switch3
Physical Config CLI Attributes
IOS Command Line Interface
Switch#show vlan
VLAN Name Status Ports
-----
1 default active Fa0/4, Fa0/5, Fa0/6, Fa0/7
Fa0/8, Fa0/9, Fa0/10, Fa0/12
Fa0/13, Fa0/14, Fa0/15, Fa0/16
Fa0/17, Fa0/18, Fa0/19, Fa0/20
Fa0/21, Fa0/22, Fa0/23, Fa0/24
2 lab210 active
3 lab211 active
4 lab212 active
5 profa active
6 server active Gig0/1
7 adm active Fa0/1, Fa0/2, Fa0/3
8 wifi active Fa0/11
99 native active
1002 fddi-default active
1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default active
VLAN Type SAID MTU Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2
--More--
```

Ctrl+F6 to exit CLI focus

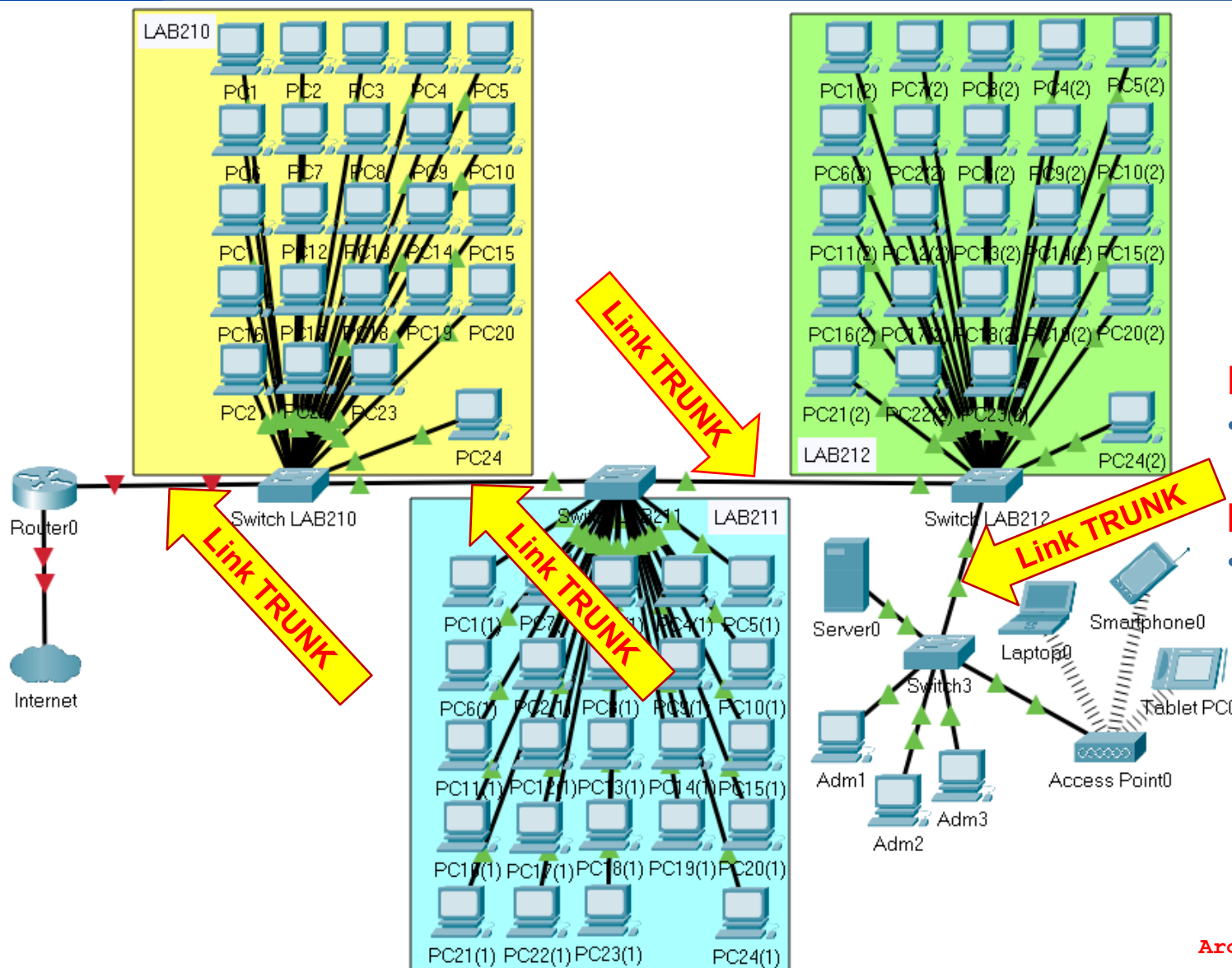
Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

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Portas (interfaces) e links **TRUNK**

Análise 1: TRUNK



Agora que as VLANs foram criadas e as interfaces associadas a cada VLAN, precisaremos configurar as **interfaces e links Trunk**

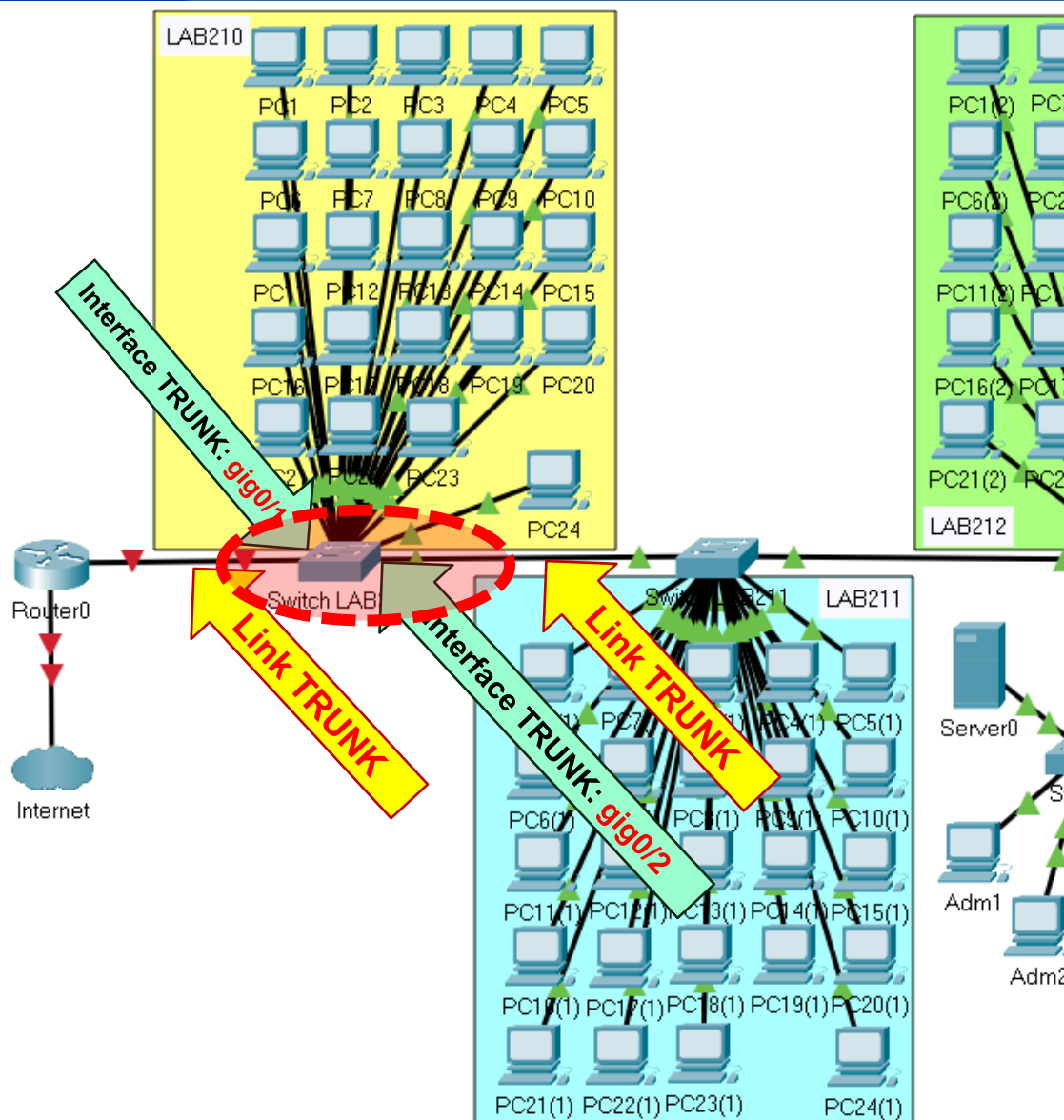
Link Trunk:

- Carrega o tráfego de múltiplas VLANs;

Interface Trunk:

- A(s) interface(s) do switch conectada(s) pelo *link trunk* precisam pertencer a todas as VLANs do switch.

Configuração 1: TRUNK no Switch LAB210



Switch LAB210

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface range gig0/1-2
Switch(config-if-range)#switchport mode trunk

Switch(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2,
changed state to down

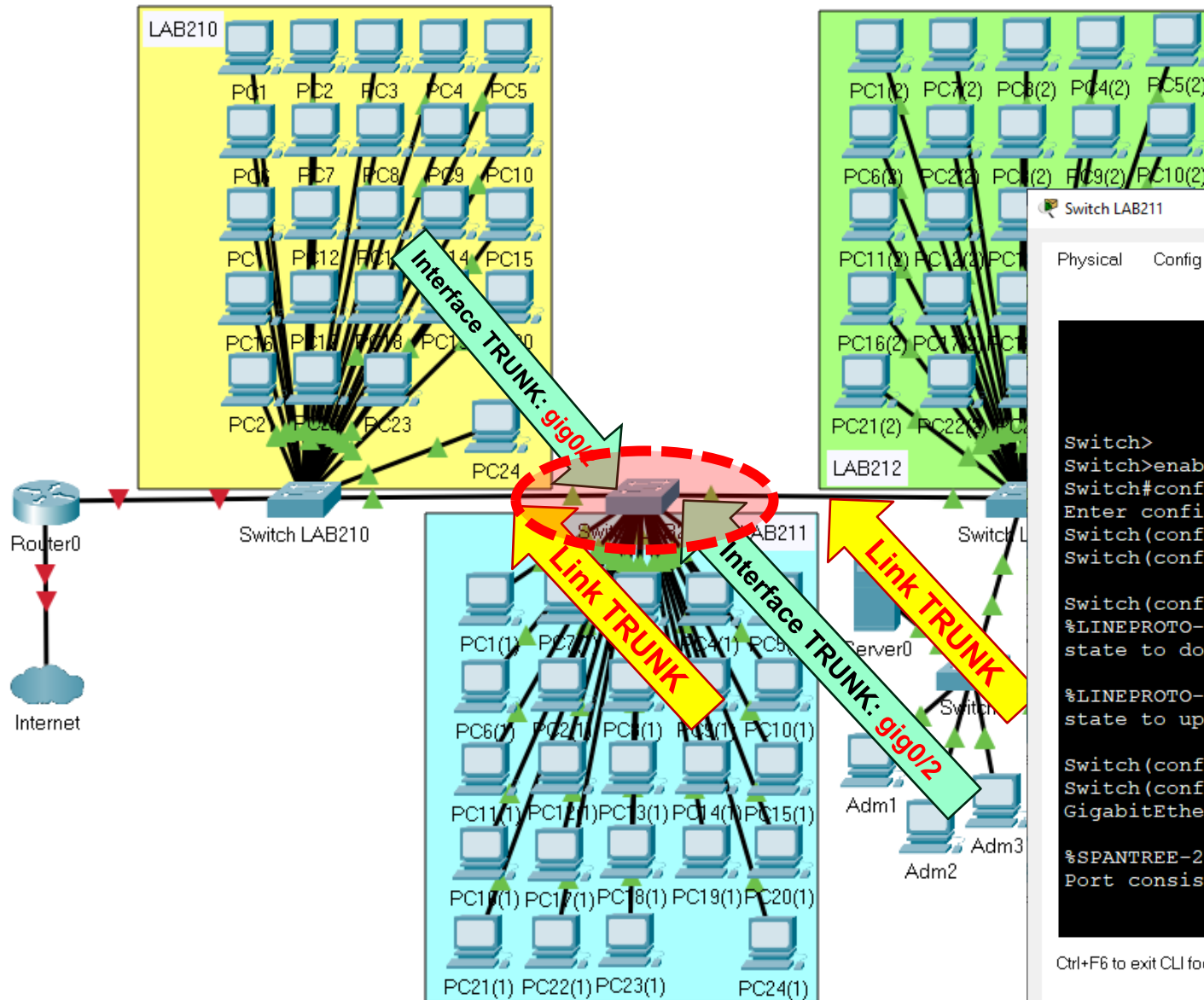
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2,
changed state to up

Switch(config-if-range)#switchport trunk native vlan 99
Switch(config-if-range)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Configuração 2: TRUNK no Switch LAB211



```
Switch LAB211
Physical Config CLI Attributes
IOS Command Line Interface

Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface range gig0/1-2
Switch(config-if-range)#switchport mode trunk

Switch(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed
state to down

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

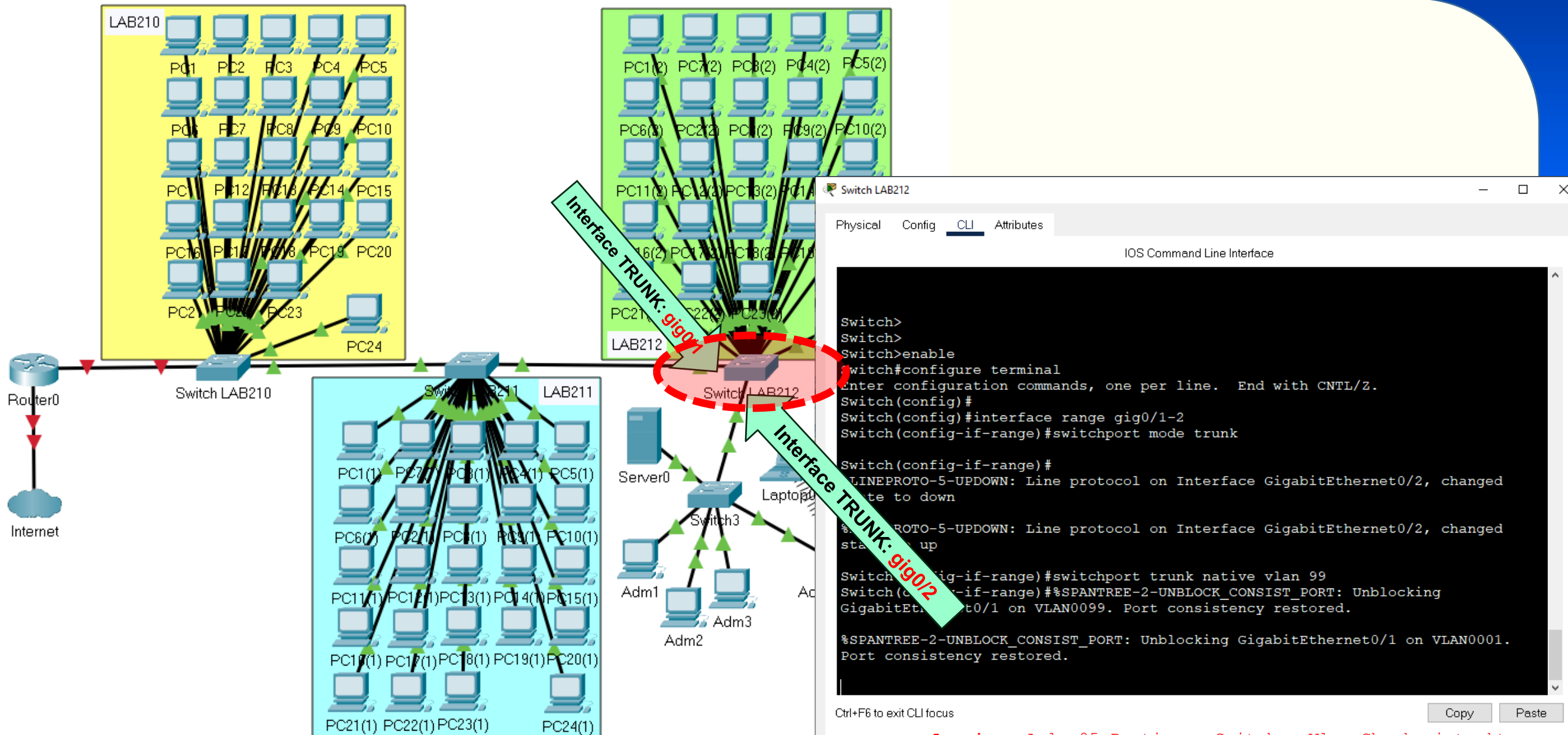
Switch(config-if-range)#switchport trunk native vlan 99
Switch(config-if-range)#%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking
GigabitEthernet0/2 on VLAN0099. Port consistency restored.

%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking GigabitEthernet0/2 on VLAN0001.
Port consistency restored.

Ctrl+F6 to exit CLI focus
```

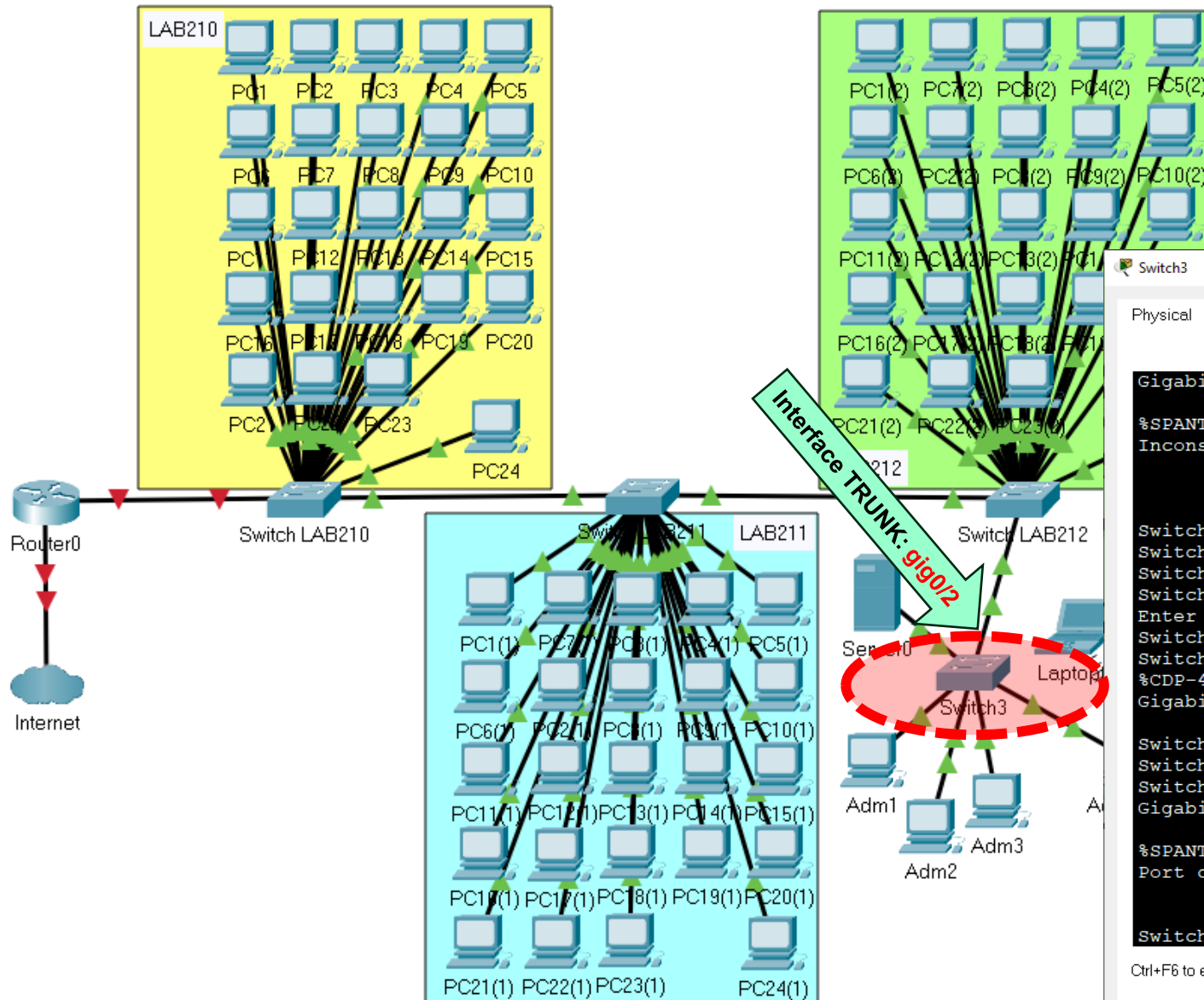
Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Configuração 3: **TRUNK** no Switch LAB211



Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Configuração 4: TRUNK no Switch3



```
Switch3
Physical  Config  CLI  Attributes
IOS Command Line Interface

GigabitEthernet0/2 VLAN1.

%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking GigabitEthernet0/2 on VLAN0001.
Inconsistent local vlan.

Switch>
Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface gig0/2
Switch(config-if)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
GigabitEthernet0/2 (1), with Switch GigabitEthernet0/2 (99).

Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk native vlan 99
Switch(config-if)#%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking
GigabitEthernet0/2 on VLAN0099. Port consistency restored.

%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking GigabitEthernet0/2 on VLAN0001.
Port consistency restored.

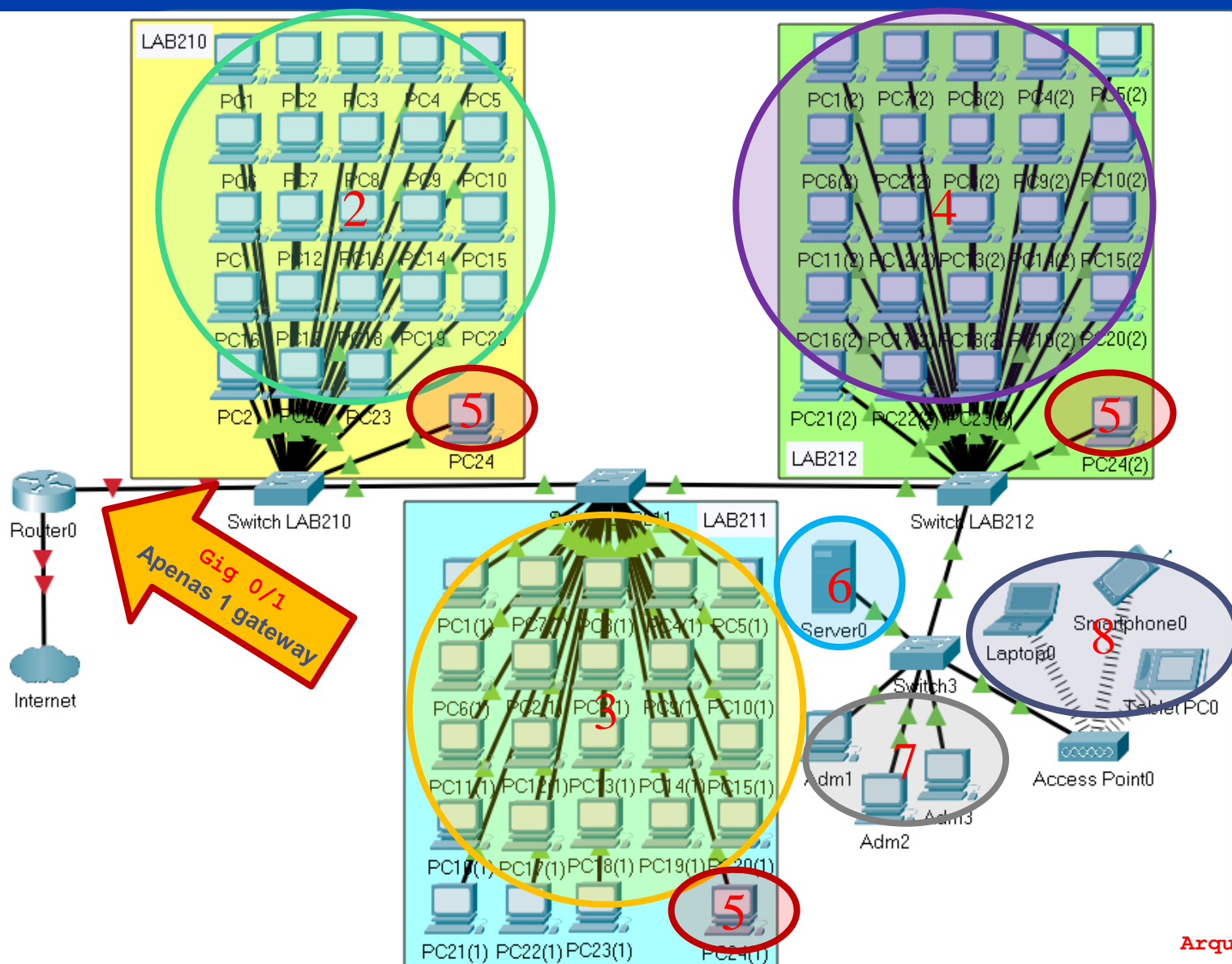
Switch(config-if)#
```

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Configuração de endereçamento IP

(1ª Parte)

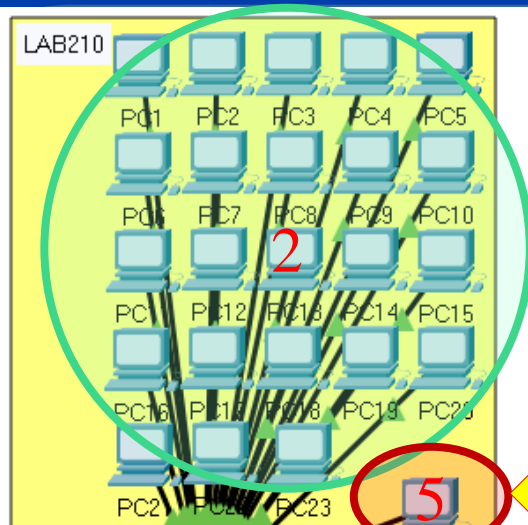
Análise 1: Endereçamento IP e Gateway



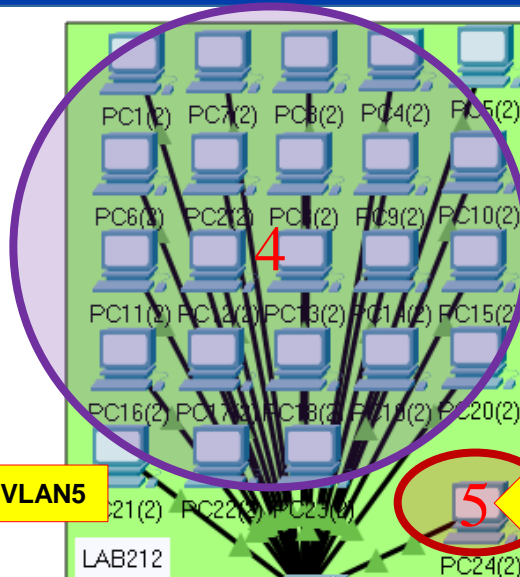
Como fica o endereçamento IP?

- Temos 7 VLANs diferentes!
- Cada VLAN é uma rede diferente (e um domínio de broadcast diferente) que exige um endereço de rede ÚNICO e exclusivo
- Cada VLAN precisará ter seu próprio GATEWAY.
- Vamos utilizar o seguinte esquema de endereçamento:
 - Vlan2: 192.168.2.0 /24
 - Vlan3: 192.168.3.0 /24
 - Vlan4: 192.168.4.0 /24
 - Vlan5: 192.168.5.0 /24
 - Vlan6: 192.168.6.0 /24
 - Vlan7: 192.168.7.0 /24
 - Vlan8: 192.168.8.0 /24
- Precisaremos 'virtualizar' o gateway (interface Gig 0/1), dividindo ele em 7 sub-interfaces (7 gateways virtuais)

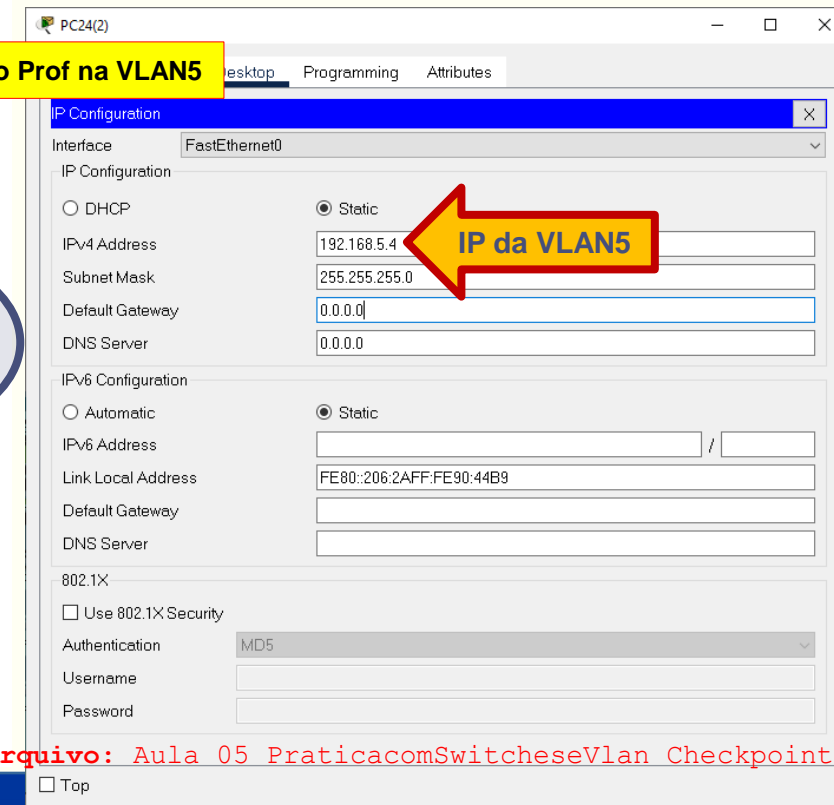
Análise 2: Endereçamento IP e Gateway



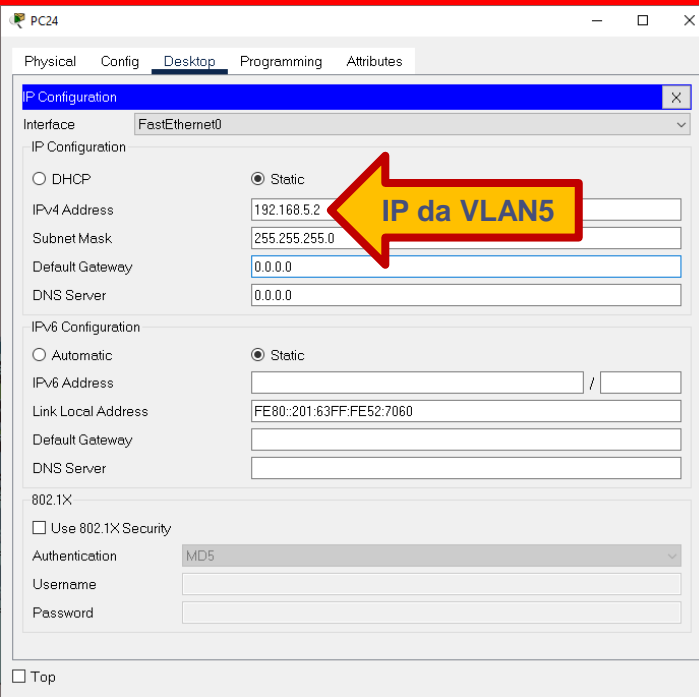
PC do Prof na VLAN5



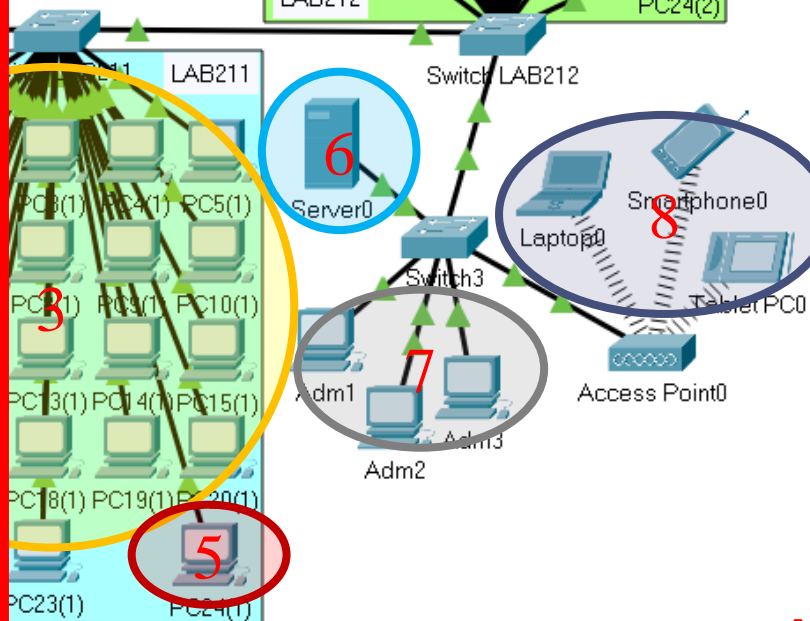
PC do Prof na VLAN5



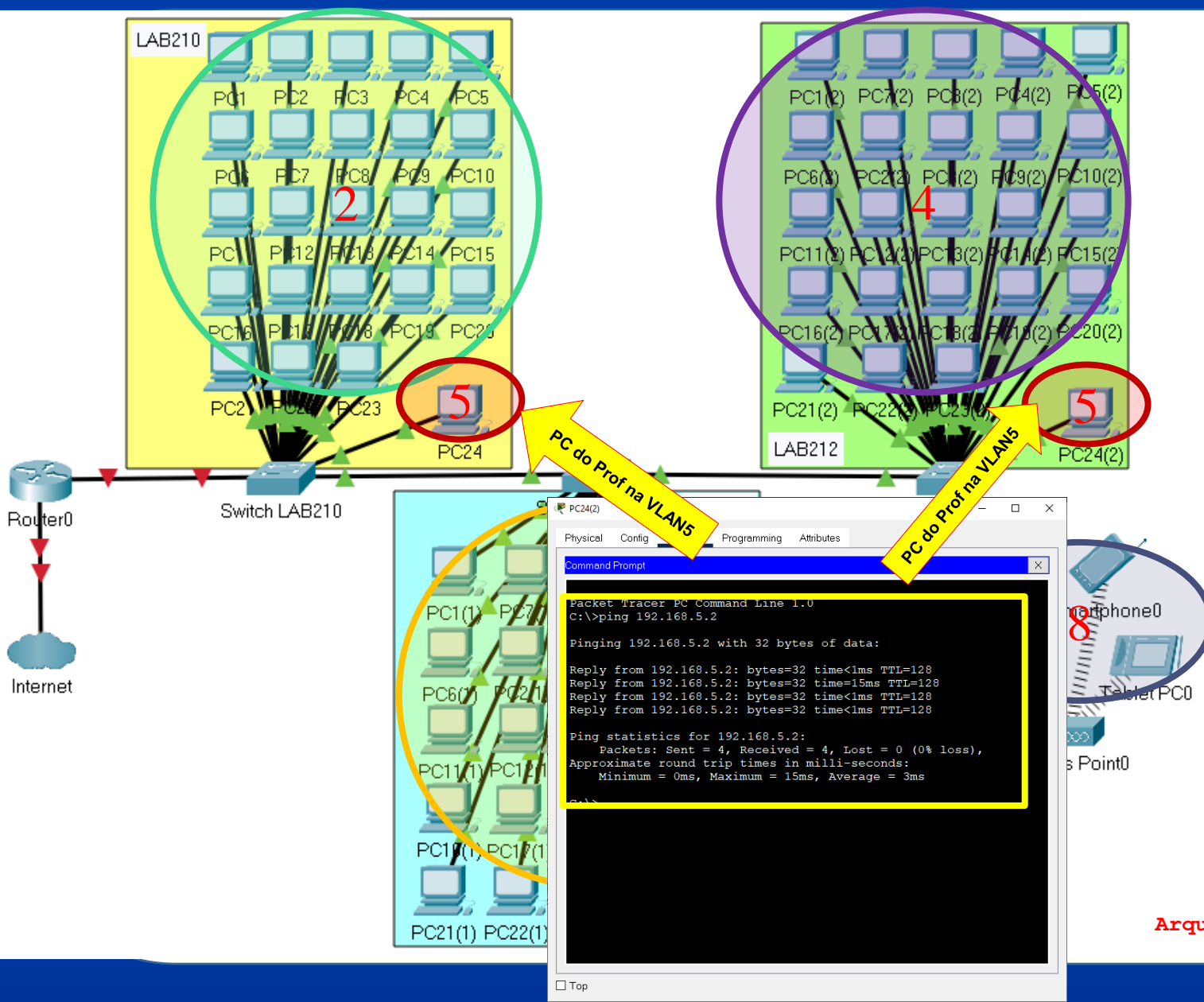
IP da VLAN5



IP da VLAN5



Análise 3: Endereçamento IP e Gateway



Observe que É POSSÍVEL estabelecer comunicação entre equipamentos que estão NA MESMA VLAN (ou seja, na mesma rede)

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 4: Endereçamento IP e Gateway

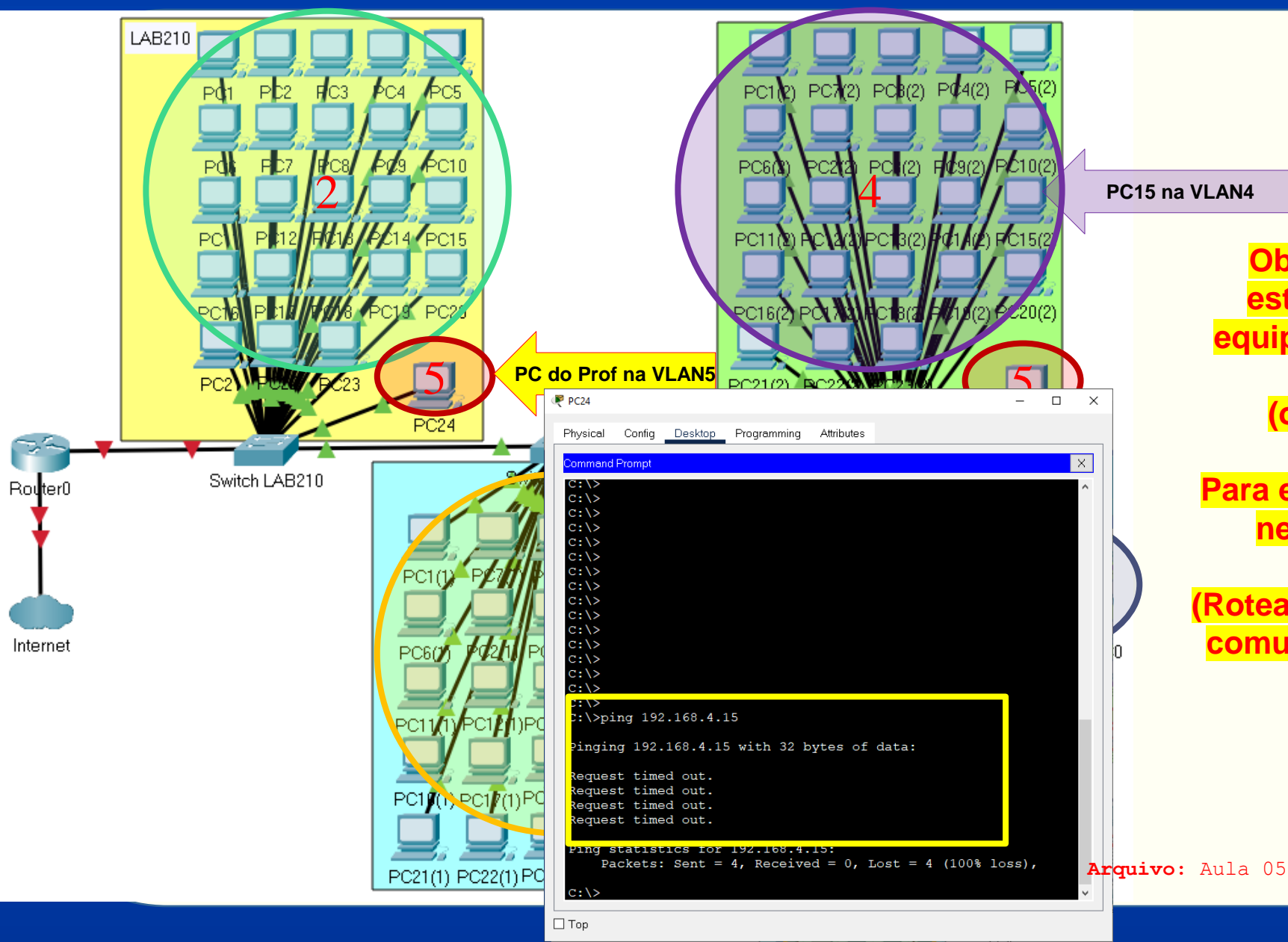
The diagram illustrates a network topology with three main VLANs: VLAN 2 (LAB210), VLAN 4 (LAB212), and VLAN 5 (LAB211). Each VLAN is represented by a grid of PC icons. VLAN 2 (LAB210) is highlighted with a green circle and contains 20 PCs (PC1 to PC20). VLAN 4 (LAB212) is highlighted with a purple circle and contains 20 PCs (PC1(2) to PC20(2)). VLAN 5 (LAB211) is highlighted with a blue circle and contains 20 PCs (PC3(1) to PC24(1)). A central switch, Switch LAB212, connects all three VLANs. Other devices connected to the network include Server0, Laptop0, Smartphone0, TabletPC0, and three administrators (Adm1, Adm2, Adm3) connected to an Access Point0.

Two configuration screenshots are shown:

- PC24 Configuration (VLAN 5):** The IP Configuration tab shows the interface FastEthernet0 configured with Static IP. The IPv4 Address is 192.168.5.2, Subnet Mask is 255.255.255.0, Default Gateway is 0.0.0.0, and DNS Server is 0.0.0.0. A red arrow points to the IP address field with the text "IP da VLAN 5".
- PC15(2) Configuration (VLAN 4):** The IP Configuration tab shows the interface FastEthernet0 configured with Static IP. The IPv4 Address is 192.168.4.15, Subnet Mask is 255.255.255.0, Default Gateway is 0.0.0.0, and DNS Server is 0.0.0.0. A red arrow points to the IP address field with the text "IP da VLAN 4".

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Análise 5: Endereçamento IP e Gateway



Observe que NÃO É POSSÍVEL estabelecer comunicação entre equipamentos que estão em VLANs diferentes (ou seja, em redes diferentes)

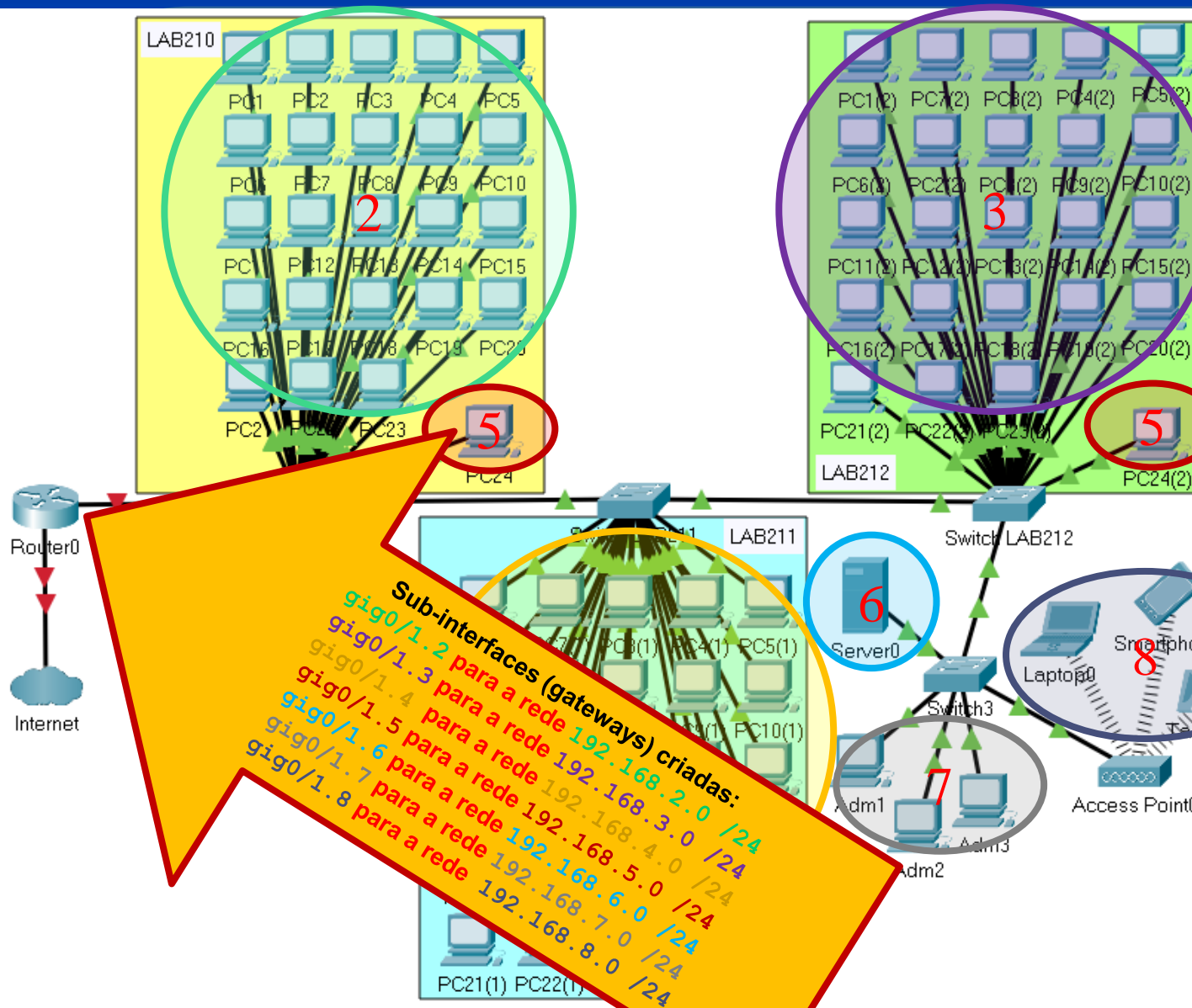
Para estabelecer a comunicação será necessário o uso do Roteador

(Roteador: equipamento que permite a comunicação entre redes diferentes)

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Configuração sub-interfaces (gateways virtuais) no roteador

Configuração 1: Endereçamento IP e Gateway



Router2

Physical Config CLI Attributes

IOS Command Line Interface

```
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gig0/1.2
Router(config-subif)#encapsulation dot1q 2
Router(config-subif)#ip address 192.168.2.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#interface gig0/1.3
Router(config-subif)#encapsulation dot1q 3
Router(config-subif)#ip address 192.168.3.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#interface gig0/1.4
Router(config-subif)#encapsulation dot1q 4
Router(config-subif)#ip address 192.168.4.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#interface gig0/1.5
Router(config-subif)#encapsulation dot1q 5
Router(config-subif)#ip address 192.168.5.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#interface gig0/1.6
Router(config-subif)#encapsulation dot1q 6
Router(config-subif)#ip address 192.168.6.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#interface gig0/1.7
Router(config-subif)#encapsulation dot1q 7
Router(config-subif)#ip address 192.168.7.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#interface gig0/1.8
Router(config-subif)#encapsulation dot1q 8
Router(config-subif)#ip address 192.168.8.1 255.255.255.0
Router(config-subif)#exit
Router(config)#interface gig0/1
Router(config-if)#no shutdown
```

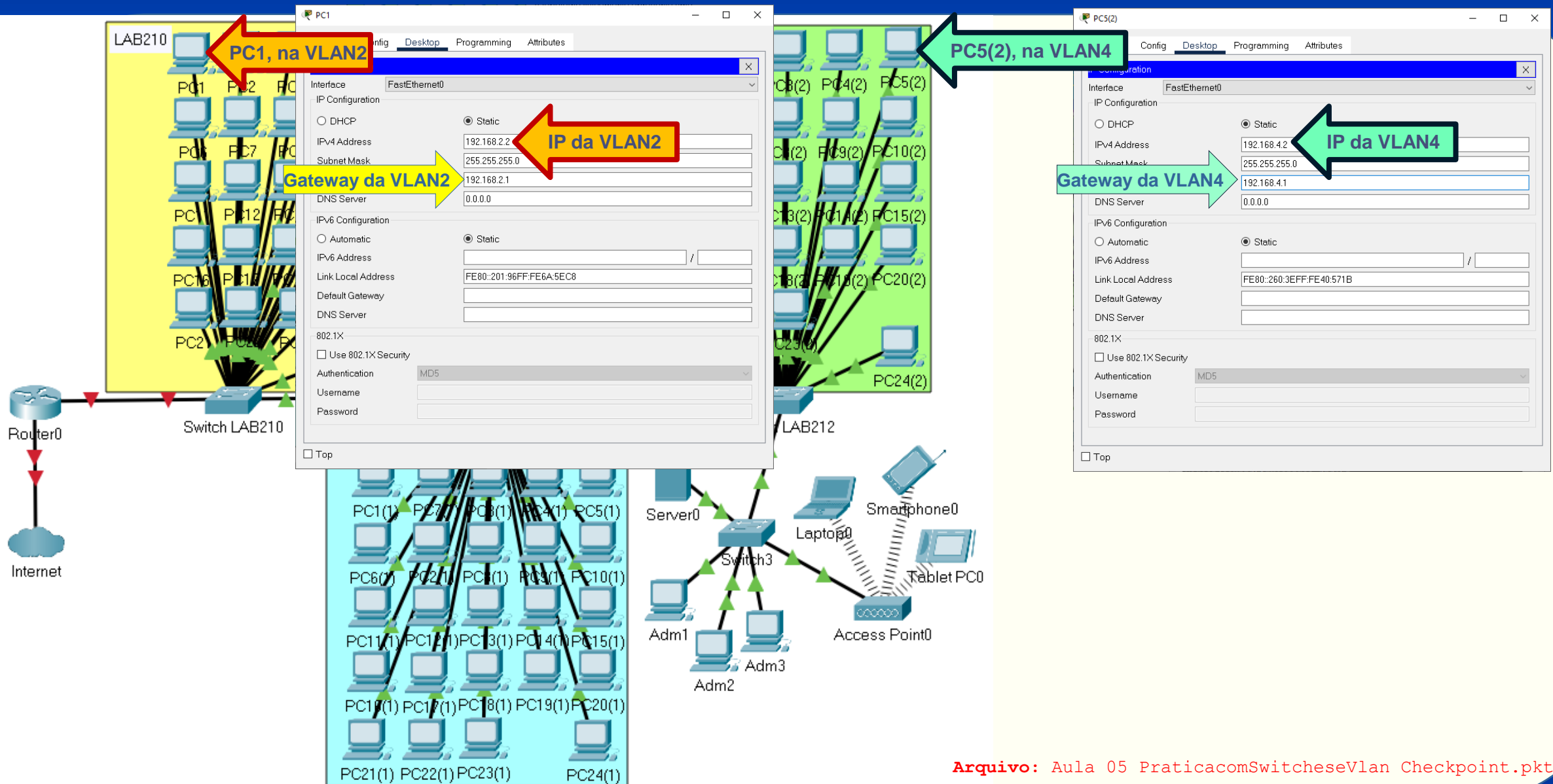
Ctrl+F6 to exit CLI focus

Copy Paste

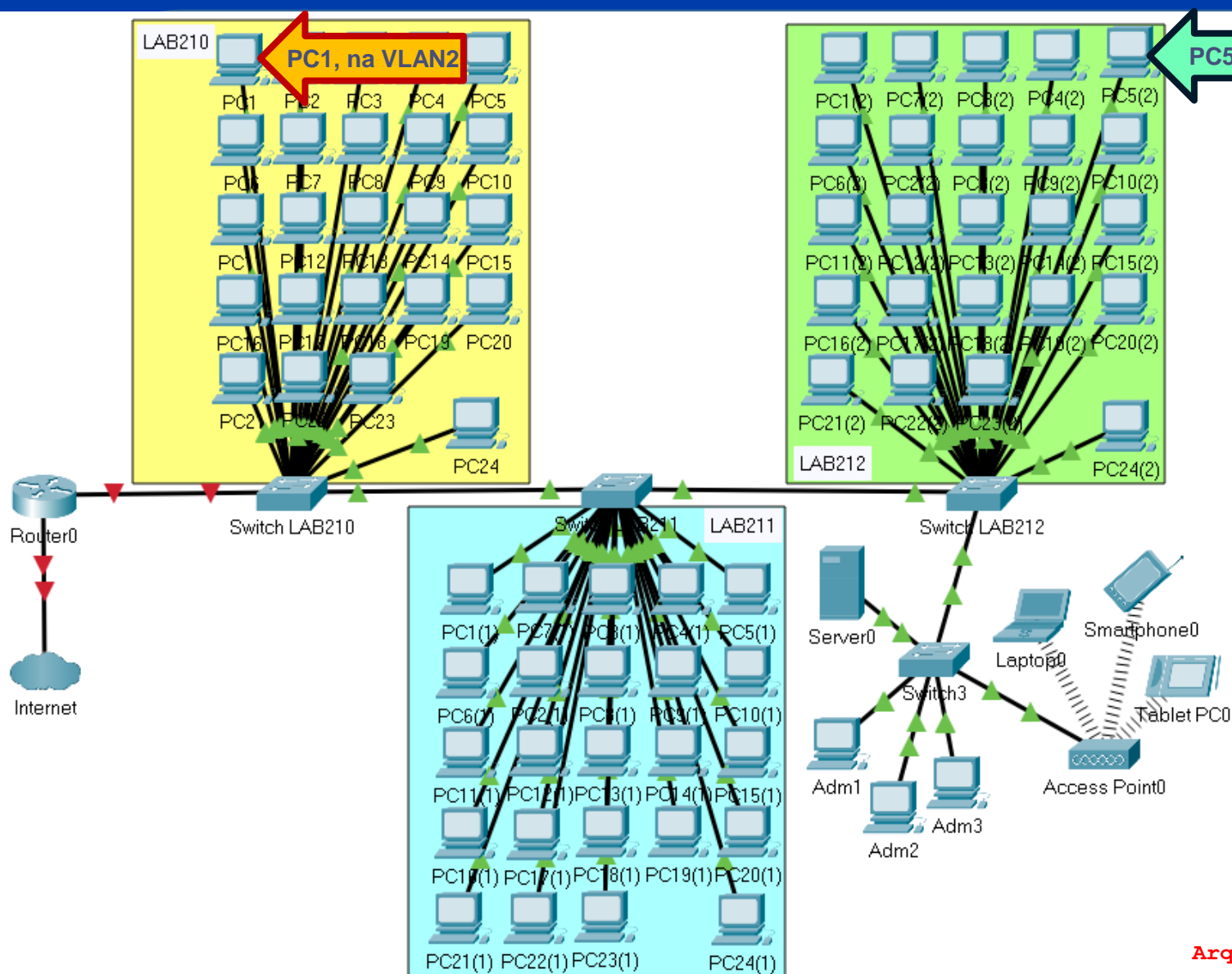
Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Top

Configuração 2: Endereçamento IP e Gateway



Análise: Endereçamento IP e Gateway



```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>
C:\>
C:\>ping 192.168.4.2

Pinging 192.168.4.2 with 32 bytes of data:

Request timed out.
Reply from 192.168.4.2: bytes=32 time<1ms TTL=127
Reply from 192.168.4.2: bytes=32 time=13ms TTL=127
Reply from 192.168.4.2: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.4.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 13ms, Average = 4ms

C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
```

Observe que agora É POSSÍVEL estabelecer comunicação entre equipamentos que estão em VLANs diferentes (ou seja, em redes diferentes)

Para estabelecer a comunicação é necessário o uso do Roteador

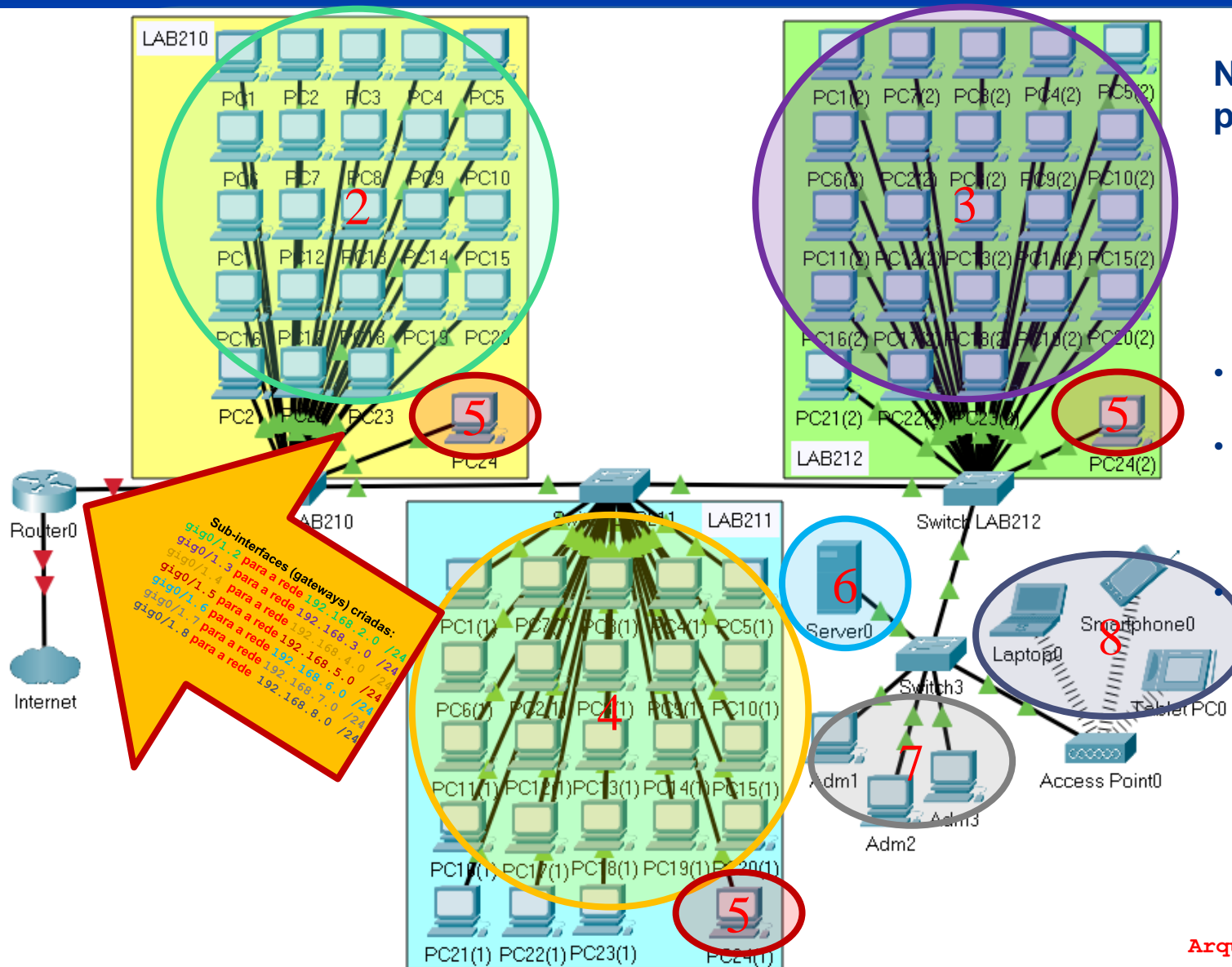
(Roteador: equipamento que permite a comunicação entre redes diferentes)

Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

Configuração de endereçamento IP

(1ª Parte)

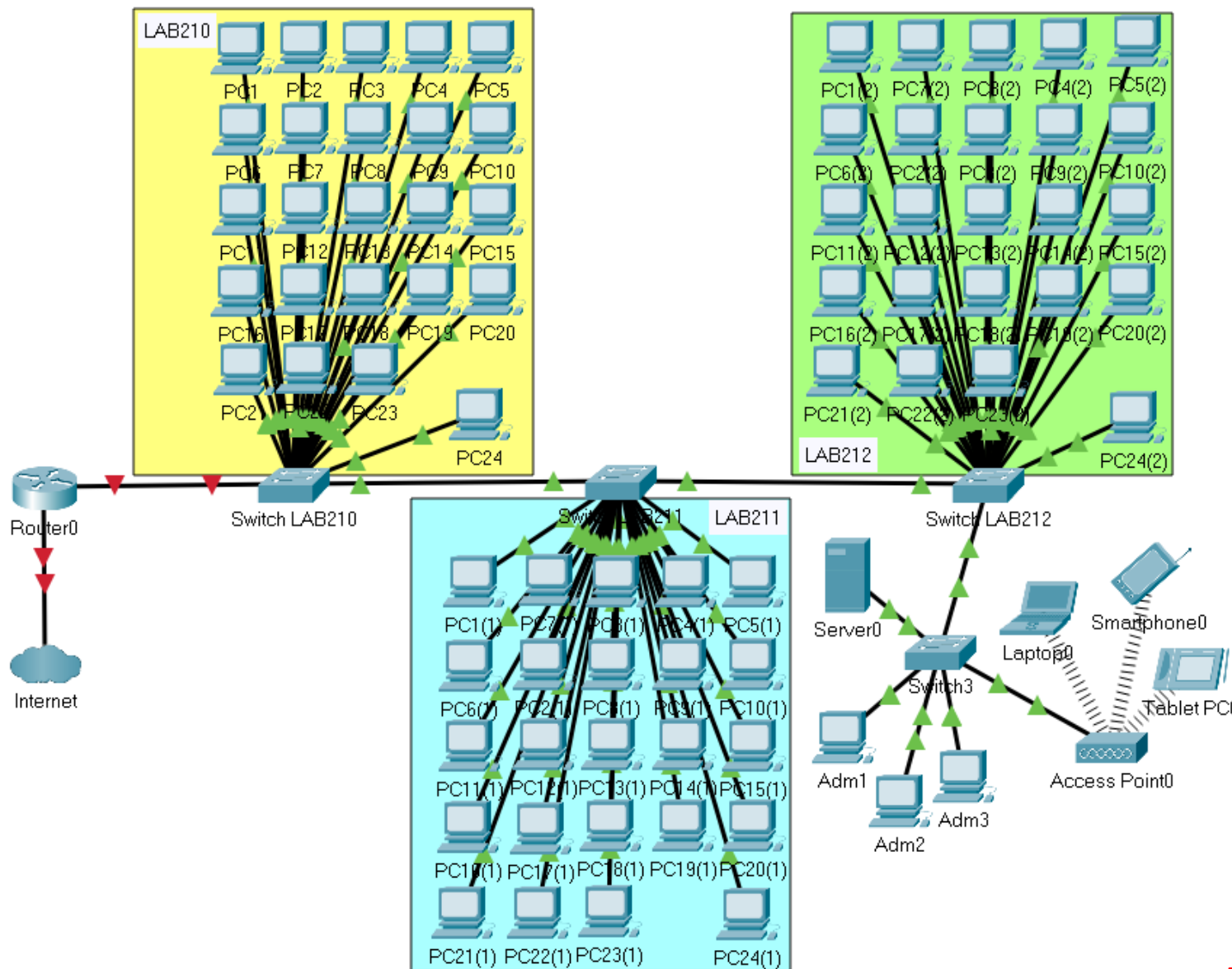
Análise : Endereçamento IP e Gateway



Na topologia temos 103 dispositivos finais que precisarão de endereço IP:

- 75 PCs
 - 1 servidor
 - 1 notebook
 - 1 smartphone
 - 1 tablet
- Faremos uso de DHCP ou configuração manual?
 - Lembre-se que um servidor DHCP só existe no escopo da rede local. Então cada VLAN (cada rede) precisará ter seu próprio DHCP.
 - Podemos configurar um serviço DHCP em cada das subinterfaces do roteador (gateways)
 - 7 VLANs Redes = 7 subinterfaces = 7 serviços DHCP

Configuração: Serviço DHCP no Roteador

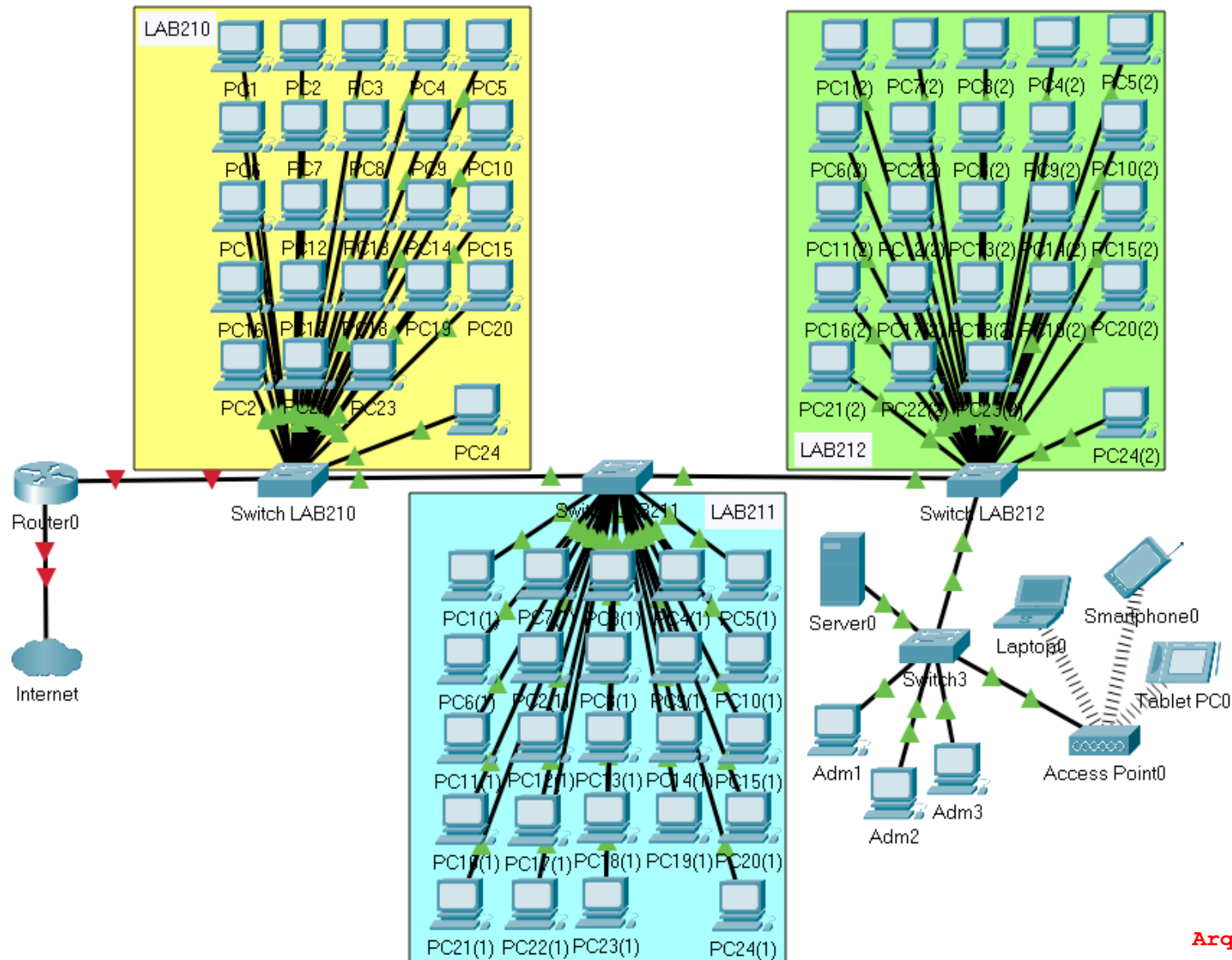


```
Router2
Physical Config CLI Attributes
IOS Command Line Interface

Router>
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp pool VLAN2
Router(dhcp-config)#default-router 192.168.2.1
Router(dhcp-config)#net 192.168.2.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
Router(dhcp-config)#ip dhcp pool VLAN3
Router(dhcp-config)#default-router 192.168.3.1
Router(dhcp-config)#net 192.168.3.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
Router(dhcp-config)#ip dhcp pool VLAN4
Router(dhcp-config)#default-router 192.168.4.1
Router(dhcp-config)#net 192.168.4.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
Router(dhcp-config)#ip dhcp pool VLAN5
Router(dhcp-config)#default-router 192.168.5.1
Router(dhcp-config)#net 192.168.5.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
Router(dhcp-config)#ip dhcp pool VLAN6
Router(dhcp-config)#default-router 192.168.6.1
Router(dhcp-config)#net 192.168.6.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
Router(dhcp-config)#ip dhcp pool VLAN7
Router(dhcp-config)#default-router 192.168.7.1
Router(dhcp-config)#net 192.168.7.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
Router(dhcp-config)#ip dhcp pool VLAN8
Router(dhcp-config)#default-router 192.168.8.1
Router(dhcp-config)#net 192.168.8.0 255.255.255.0
Router(dhcp-config)#dns-server 192.168.6.2
Router(dhcp-config)#
```

Arquivo: Aula_05_PraticacomSwitcheseVlan_Checkpoint.pkt

Configuração: Serviço DHCP no Roteador



Arquivo: Aula 05 PraticacomSwitcheseVlan Checkpoint.pkt

VLAN

Resumo de configuração

Resumo da Configuração de VLAN

Criar VLAN

```
Switch(vlan)#vlan 2  
Switch(vlan)#name marketing  
Switch(vlan)#exit
```

Definir a VLAN de uma porta em modo acesso

```
Switch(config)#interface fastethernet f0/9  
Switch(config-if)#switchport mode access  
Switch(config-if)#switchport access vlan 2
```

Definir a VLAN de uma porta em modo tronco (*trunk*)

```
Switch(config-if)#interface ethernet f0/7  
Switch(config-if)#switchport mode trunk  
Switch(config-if)#switchport trunk allowed vlan all
```

Atividade para o primeiro **CheckPoint** de 2024

1. Siga o passo a passo descrito nos slides e configure, no software Cisco Packet Tracer, o ambiente apresentado no arquivo **Aula 05 2024 PraticacomSwitcheseVlan checkpoint.pkt**;
2. Estude o conteúdo relacionado: Capítulo 3 VLANs na Plataforma NetAcademy

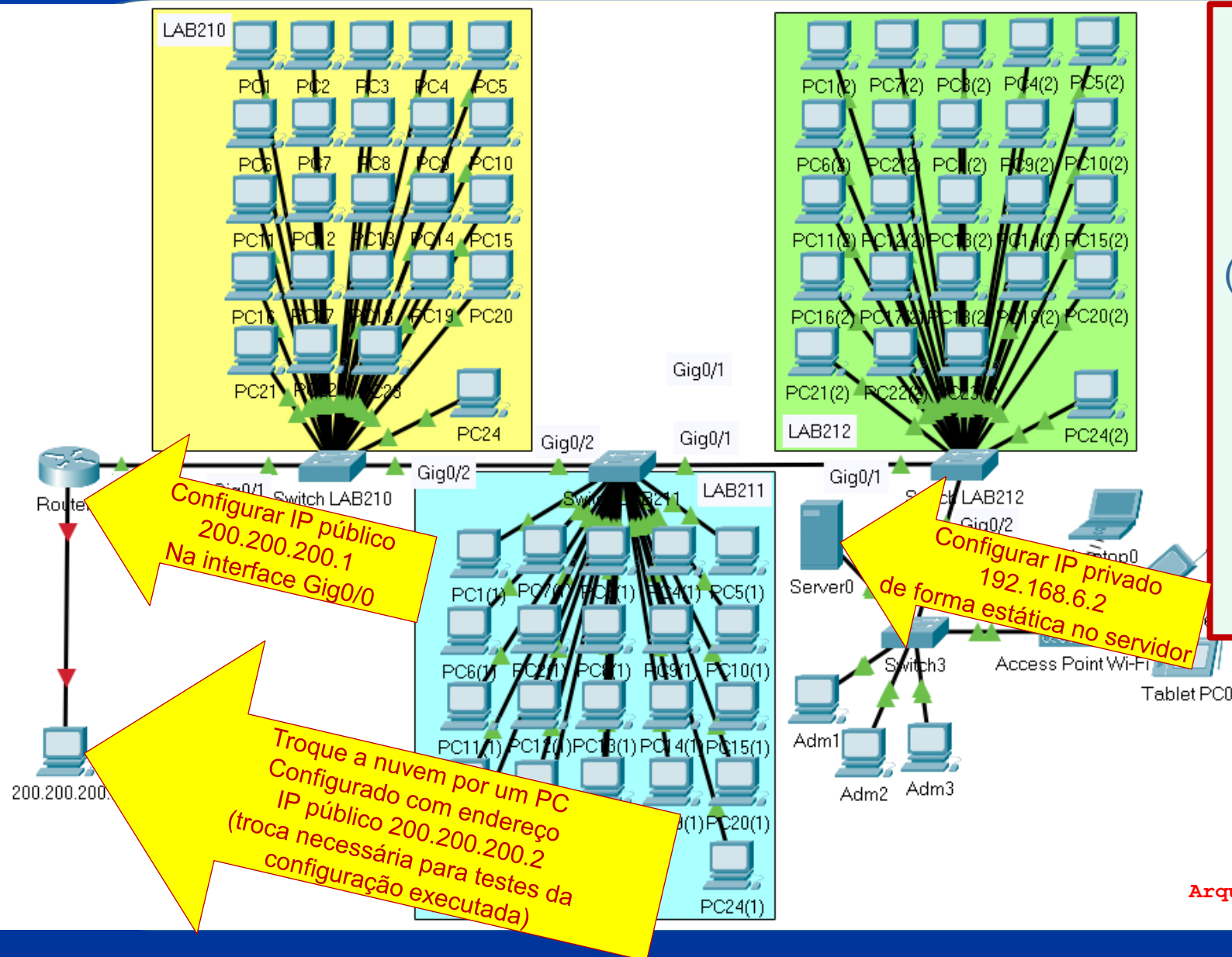
3	VLANs	^
3.0	Introdução	v
3.1	Resumo das VLANs	v
3.2	VLANs em um ambiente de vários switches	v
3.3	Configuração da VLAN	v
3.4	Troncos de VLAN	v
3.5	Dynamic Trunking Protocol	v
3.6	Módulo Prática e Quiz	v

3. No dia agendado para o 1º Checkpoint, utilize o link informado pelo professor via **MsTeams** para resolver as questões do formulário apresentado;
4. Não será necessário entregar o arquivo .pkt, apenas resolver as questões que estarão disponíveis no formulário obtido a partir do link que será enviado pelo professor.
5. **IMPORTANTE:** a avaliação é individual e deverá ser resolvida no horário da aula da disciplina. No dia da avaliação.
 1. O formulário deverá ser preenchido durante o horário de aula e sua submissão será utilizada para lançamento de presença na aula.

Desafio NAT

Acréscete uma configuração NAT

Configuração: NAT no Router0



Atividade Final:

Realizar as configurações apontadas nas setas e **configurar NAT** (do tipo PAT) no Router2 associando o IP Público 200.200.200.1 (para a porta TCP 80) ao endereço IP privado no Server0 (para a porta TCP 80)

Dica:

Veja o roteiro de configuração no arquivo Aula12_2021 Configuração NAT Estático, Dinâmico e PAT.pdf

Para estudo:

Conceitos Essenciais de Roteamento e Switching

Capítulo 5
Configuração de switches

Capítulo 6
VLANs

Capítulo 7
Listas de Controle de Acesso

Capítulo 8
DHCP

Capítulo 9
NAT para IPv4

Capítulo 10
Descoberta, gerenciamento e manutenção
de dispositivos

Seção 6.0
Ferramentas

Seção 6.1
Segmentação de VLAN

Seção 6.2
Implementações de VLAN

Seção 6.3
Roteamento entre VLANs com o
uso de roteadores

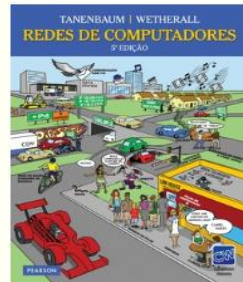
Seção 6.4
Resumo

<https://www.netacad.com/>

Referências Bibliográficas



Kurose, James F. Redes de computadores e a Internet: uma abordagem top-down/James F. Kurose e Keith W. Ross; 6ª edição, São Paulo: Addison Wesley, 2013. ISBN 978-85-8143-677-7.



Tanenbaum, Andrew S; Wetherall, David. Redes de Computadores. São Paulo: Pearson Prentice Hall, 2011. 5ª edição americana. ISBN 978-85-7605-924-0.



BIRKNER, Mathew H. Projeto de Interconexão de Redes. São Paulo: Pearson Education do Brasil, 2003. ISBN 85.346.1499-7.

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- Wikipedia. IEEE 802.1Q. Disponível em http://en.wikipedia.org/wiki/IEEE_802.1Q
- IEEE. 802.1Q-2011 - IEEE Standard for Local and metropolitan area networks-- Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks. Disponível em <http://standards.ieee.org/findstds/standard/802.1Q-2011.html>
- ODOM, W. CCNA ICND2 – Guia Oficial de Certificação do Exame. 2ª ed. Alta Books, 2008.