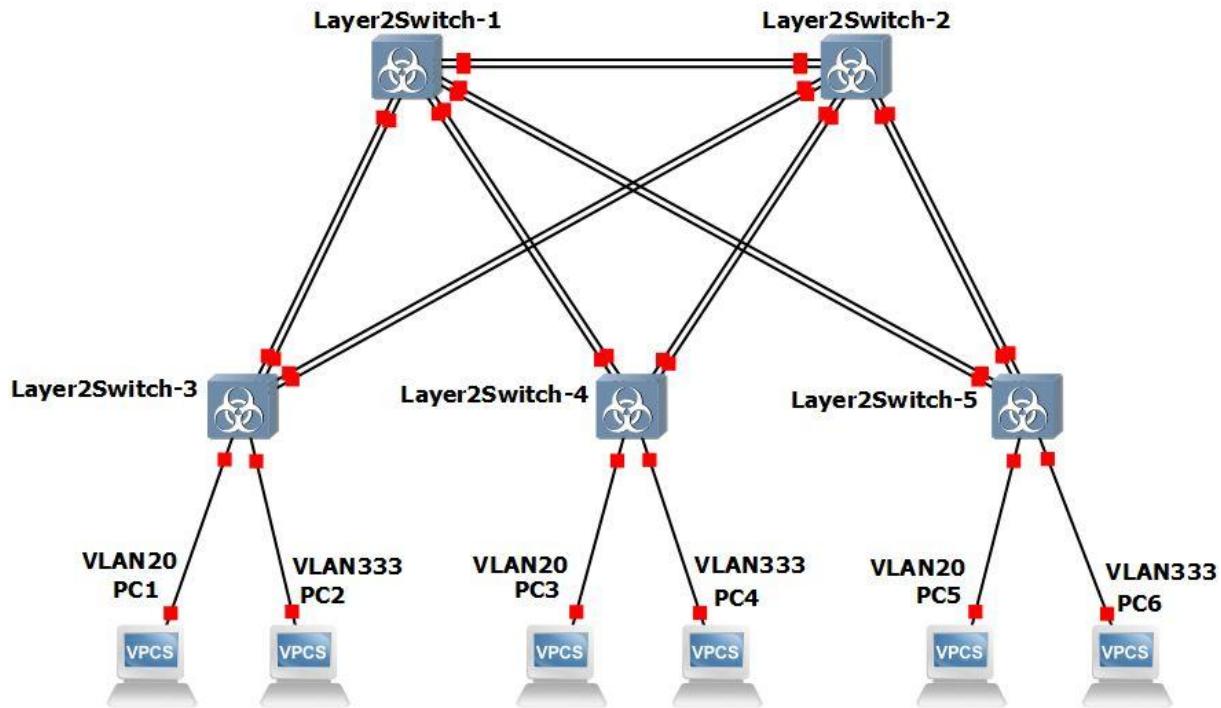


Тема: Настройка виртуальной локальной сети (VLAN)

- 1) Для заданной на схеме schema-lab3 сети, состоящей из управляемых коммутаторов и персональных компьютеров настроить на коммутаторах логическую топологию используя протокол IEEE 802.1Q, для передачи пакетов VLAN333 между коммутаторами использовать Native VLAN



Для начала создадим VLAN20 и VLAN333 на каждом коммутаторе, а также настроим магистральные порты между коммутаторами для передачи Native VLAN = 333

Для switch3, switch4, switch5

enable

configure terminal

vlan 20

name VLAN20

exit

vlan 333

name VLAN333

exit

Настройка для PC VLAN20

interface Gi1/0

```
switchport mode access
switchport access vlan 20
no shutdown
exit
```

Для PC VLAN333

```
interface Gi 1/1
switchport mode access
switchport access vlan 333
no shutdown
exit
```

Порты к свич (trunk)

```
interface Gi0/0
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
interface Gi0/1
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
interface Gi0/2
switchport trunk encapsulation dot1q
switchport mode trunk
```

```
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
interface Gi0/3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
end
write memory
```

Для switch1 и switch2 появится настройка ещё двух портов, а вместо настроек портов для ПК будет настройка trunk-портов.

```
interface Gi1/0
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
interface Gi1/1
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
interface Gi1/2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

```
interface Gi1/3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
no shutdown
exit
```

Проверить настройку можно, введя команду show interfaces trunk

```
show interfaces trunk

Port      Mode          Encapsulation  Status        Native vlan
Gi0/0     on           802.1q        trunking    333
Gi0/1     on           802.1q        trunking    333
Gi0/2     on           802.1q        trunking    333
Gi0/3     on           802.1q        trunking    333
Gi1/0     on           802.1q        trunking    333
Gi1/1     on           802.1q        trunking    333
Gi1/2     on           802.1q        trunking    333
Gi1/3     on           802.1q        trunking    333

Port      Vlans allowed on trunk
Gi0/0    20,333
Gi0/1    20,333
Gi0/2    20,333
Gi0/3    20,333
Gi1/0    20,333
Gi1/1    20,333
Gi1/2    20,333
Gi1/3    20,333

Port      Vlans allowed and active in management domain
Gi0/0    20,333
```

2) Проверить доступность персональных компьютеров, находящихся в одинаковых VLAN и недоступность находящихся в различных, результаты задокументировать

Назначим PC IP-адреса, а после проверим ping.

Для PC1

ip 217.71.20.1

save

Для PC2

ip 217.71.33.1

save

Для PC3

ip 217.71.20.2

save

Для PC4

ip 217.71.33.2

save

Для PC5

ip 217.71.20.3

save

Для PC6

ip 217.71.33.3

save

Примеры пинга всех компьютеров с PC1 и PC2

```
PC1> ip 217.71.20.1
Checking for duplicate address...
PC1 : 217.71.20.1 255.255.255.0

PC1> save
Saving startup configuration to startup.vpc
. done

PC1> ping 217.71.20.2

84 bytes from 217.71.20.2 icmp_seq=1 ttl=64 time=8.988 ms
84 bytes from 217.71.20.2 icmp_seq=2 ttl=64 time=5.673 ms
84 bytes from 217.71.20.2 icmp_seq=3 ttl=64 time=12.924 ms
84 bytes from 217.71.20.2 icmp_seq=4 ttl=64 time=9.100 ms
84 bytes from 217.71.20.2 icmp_seq=5 ttl=64 time=9.221 ms

PC1> ping 217.71.20.3

84 bytes from 217.71.20.3 icmp_seq=1 ttl=64 time=12.252 ms
84 bytes from 217.71.20.3 icmp_seq=2 ttl=64 time=17.728 ms
84 bytes from 217.71.20.3 icmp_seq=3 ttl=64 time=15.025 ms
84 bytes from 217.71.20.3 icmp_seq=4 ttl=64 time=3.533 ms
84 bytes from 217.71.20.3 icmp_seq=5 ttl=64 time=16.384 ms

PC1> ping 217.71.33.1

No gateway found

PC1> ping 217.71.33.2

No gateway found

PC1> ping 217.71.33.3

No gateway found
```

```
PC2> ip 217.71.33.1
Checking for duplicate address...
PC2 : 217.71.33.1 255.255.255.0

PC2> save
Saving startup configuration to startup.vpc
. done

PC2> ping 217.71.33.2

84 bytes from 217.71.33.2 icmp_seq=1 ttl=64 time=9.368 ms
84 bytes from 217.71.33.2 icmp_seq=2 ttl=64 time=3.984 ms
84 bytes from 217.71.33.2 icmp_seq=3 ttl=64 time=10.540 ms
84 bytes from 217.71.33.2 icmp_seq=4 ttl=64 time=25.070 ms
84 bytes from 217.71.33.2 icmp_seq=5 ttl=64 time=11.602 ms

PC2> ping 217.71.33.3

84 bytes from 217.71.33.3 icmp_seq=1 ttl=64 time=9.143 ms
84 bytes from 217.71.33.3 icmp_seq=2 ttl=64 time=10.569 ms
84 bytes from 217.71.33.3 icmp_seq=3 ttl=64 time=6.317 ms
84 bytes from 217.71.33.3 icmp_seq=4 ttl=64 time=9.360 ms
84 bytes from 217.71.33.3 icmp_seq=5 ttl=64 time=4.688 ms

PC2> ping 217.71.20.1

No gateway found

PC2> ping 217.71.20.2

No gateway found

PC2> ping 217.71.20.3

No gateway found
```

3) Перехватить в Wireshark пакеты с тегами и без тегов (nb!), результаты задокументировать

Захват пакетов с тегами VLAN20. Передаются BDPU-пакеты. Добавляется заголовок VLAN, состоящий из приоритета (0), кадр не подлежит отбрасыванию при перегрузке, а также имеет VLAN.id == 20

vlan.id == 20 && !stp						
No.	Time	Source	Destination	Protocol	Length	Info
963	772.130772	Private_66:68:00	Broadcast	ARP	68	Who has 217.71.20.3? Tell 217.71.20.1


```

> Frame 963: Packet, 68 bytes on wire (544 bits), 68 bytes captured (544 bits) on interface -, id 0
> Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:00), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
< 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 20
    000. .... .... = Priority: Best Effort (default) (0)
    ..0 .... .... = DEI: Ineligible
    .... 0001 0100 = ID: 20
    Type: ARP (0x0806)
    Padding: 000000000000000000000000000000000000000000000000
    Trailer: 00000000
< Address Resolution Protocol (request)

```

Тегированный VLAN333 трафик. Проходят только DTP-кадры для согласования trunk

vlan.id == 333 && !stp						
No.	Time	Source	Destination	Protocol	Length	Info
645	517.416364	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
683	548.698652	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
686	551.315770	0:c:3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
722	580.045849	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
729	585.966733	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
768	611.625049	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
771	621.064152	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
801	643.013549	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
819	655.967011	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
842	674.577474	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
861	690.512758	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
877	705.188850	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
903	725.456753	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
914	735.370234	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
946	760.164242	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
955	765.896415	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
990	794.826836	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
994	796.487946	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
1031	827.500293	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
1034	829.322719	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
1067	848.269525	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
1075	864.120242	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
1107	888.986851	0:c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol
1120	898.864087	0:c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	DTP	62	Dynamic Trunk Protocol


```

> Frame 955: Packet, 62 bytes on wire (496 bits), 62 bytes captured (496 bits) on interface -, id 0
> Ethernet II, Src: 0:c:fe:8c:bf:00:03 (0:c:fe:8c:bf:00:03), Dst: CDP/FTP/DTP/PAgP/UDLD (01:00:0c:cc:cc:cc)
> 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 333
> Logical-Link Control
> Dynamic Trunk Protocol: CISCO-vIOS (Operating/Administrative): Trunk/On (0x81) (Operating/Administrative): 802.1Q/802.1Q (0xa5): 0:c:f

```

0000	01 00 0c cc
0010	00 2c aa a1
0020	49 53 43 4f
0030	03 00 05 a1

Нетегированный трафик. Несмотря на то, что ARP-запрос имеет VLAN.id = 333 он входит в нетегированный трафик, так как ранее trunk-режим был согласован и NativeVLAN теперь 333. Также регулярно проходят пакеты с информацией о подключениях и портах.

No.	Time	Source	Destination	Protocol	Length	Info
997	798.926205	0c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	CDP	424	Device ID: Switch Port ID: GigabitEthernet0/3
998	799.619135	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1005	806.555420	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1010	811.229903	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1017	816.817261	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1022	821.552125	0c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	CDP	424	Device ID: Switch Port ID: GigabitEthernet0/3
1025	822.684023	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1030	827.093383	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1039	834.014604	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1043	837.300022	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1051	845.491351	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1054	847.531467	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1065	857.044371	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1066	857.882644	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1070	860.098376	0c:c3:74:98:00:03	CDP/FTP/DTP/PAgP/UD...	CDP	424	Device ID: Switch Port ID: GigabitEthernet0/3
1080	868.050091	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1081	868.867340	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1086	872.557431	0c:fe:8c:bf:00:03	CDP/FTP/DTP/PAgP/UD...	CDP	424	Device ID: Switch Port ID: GigabitEthernet0/3
1093	878.151086	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1096	880.285745	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1101	884.543360	Private_66:68:01	Broadcast	ARP	64	Who has 217.71.33.2? Tell 217.71.33.1
1106	888.580333	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply
1110	892.074026	0c:c3:74:98:00:03	0c:c3:74:98:00:03	LOOP	60	Reply
1117	898.771384	0c:fe:8c:bf:00:03	0c:fe:8c:bf:00:03	LOOP	60	Reply

> Frame 1101: Packet, 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface -, id 0
 > Ethernet II, Src: Private_66:68:01 (00:50:79:66:68:01), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
 > Address Resolution Protocol (request)

4) Сохранить файлы конфигураций устройств в виде набора файлов с именами, соответствующими именам устройств

5*) Опциональное задание: Добавить в схему маршрутизатор, подключенный к коммутаторам Layer2Switch1 и Layer2Switch2, настроить через него маршрутизацию между VLAN

Полезная информация: избыточные физические каналы можно поместить в отдельные VLAN и обойтись без STP