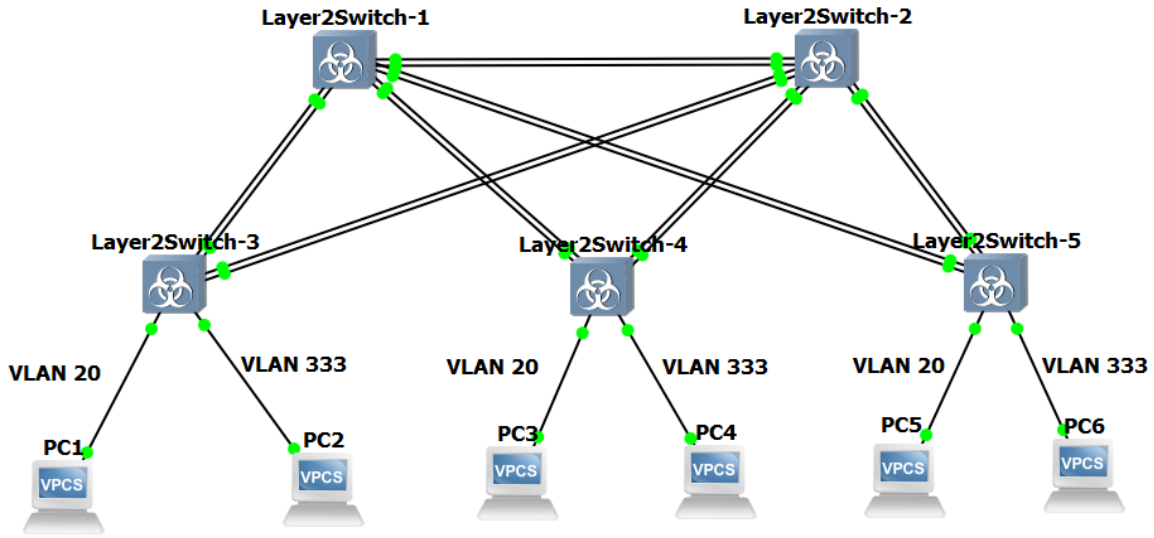
Лабораторная работа №3

«Настройка виртуальной локальной сети (VLAN)»

Для начала была построена следующая сеть:



Ниже представлена информация о настройке коммутаторов:

Layer2Switch-1 | Layer2Switch-2
enable configure terminal vlan 20 name VLAN20 exit vlan 333 name VLAN333 exit vlan 334 name BACKUP_VLAN exit interface range GigabitEthernet 0/0, GigabitEthernet 0/2, GigabitEthernet 1/0, GigabitEthernet 1/2 switchport trunk encapsulation dot1q switchport mode trunk switchport trunk native vlan 333 switchport trunk allowed vlan 20,333 exit interface range GigabitEthernet 0/1, GigabitEthernet 0/3, GigabitEthernet 1/1, GigabitEthernet 1/3 switchport trunk encapsulation dot1q switchport mode trunk switchport trunk native vlan 334 switchport trunk allowed vlan 334 exit exit write memory

Layer2Switch-3 | Layer2Switch-4 | Layer2Switch-5

```
enable
configure terminal

vlan 20
name VLAN20
exit

vlan 333
name VLAN333
exit

vlan 334
name BACKUP_VLAN
exit

interface range GigabitEthernet 0/0, GigabitEthernet 0/2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 333
switchport trunk allowed vlan 20,333
exit

interface range GigabitEthernet 0/1, GigabitEthernet 0/3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 334
switchport trunk allowed vlan 334
exit

interface GigabitEthernet 1/0
switchport mode access
switchport access vlan 20
exit

interface GigabitEthernet 1/1
switchport mode access
switchport access vlan 333
exit

exit

write memory
```

Для ПК с помощью команды «ip» были заданы следующие адреса:

Название ПК	IPv4
PC1	192.168.10.21/24
PC2	192.168.10.31/24
PC3	192.168.10.22/24
PC4	192.168.10.32/24
PC5	192.168.10.23/24
PC6	192.168.10.33/24

Далее была проведена проверка доступности/недоступности разных ПК в сети. Для примера были взяты PC1, PC2 и PC5.

PC1:

```
PC1> ping 192.168.10.31

host (192.168.10.31) not reachable

PC1> ping 192.168.10.22

84 bytes from 192.168.10.22 icmp_seq=1 ttl=64 time=7.400 ms
84 bytes from 192.168.10.22 icmp_seq=2 ttl=64 time=12.426 ms
84 bytes from 192.168.10.22 icmp_seq=3 ttl=64 time=2.150 ms
84 bytes from 192.168.10.22 icmp_seq=4 ttl=64 time=6.122 ms
84 bytes from 192.168.10.22 icmp_seq=5 ttl=64 time=1.947 ms

PC1> ping 192.168.10.32

host (192.168.10.32) not reachable

PC1> ping 192.168.10.23

84 bytes from 192.168.10.23 icmp_seq=1 ttl=64 time=9.483 ms
84 bytes from 192.168.10.23 icmp_seq=2 ttl=64 time=6.925 ms
84 bytes from 192.168.10.23 icmp_seq=3 ttl=64 time=16.137 ms
84 bytes from 192.168.10.23 icmp_seq=4 ttl=64 time=14.713 ms
84 bytes from 192.168.10.23 icmp_seq=5 ttl=64 time=2.086 ms

PC1> ping 192.168.10.33

host (192.168.10.33) not reachable
```

PC2:

```
PC2> ping 192.168.10.21

host (192.168.10.21) not reachable

PC2> ping 192.168.10.22

host (192.168.10.22) not reachable

PC2> ping 192.168.10.32

84 bytes from 192.168.10.32 icmp_seq=1 ttl=64 time=5.252 ms
84 bytes from 192.168.10.32 icmp_seq=2 ttl=64 time=7.363 ms
84 bytes from 192.168.10.32 icmp_seq=3 ttl=64 time=2.049 ms
84 bytes from 192.168.10.32 icmp_seq=4 ttl=64 time=7.395 ms
84 bytes from 192.168.10.32 icmp_seq=5 ttl=64 time=7.604 ms

PC2> ping 192.168.10.23

host (192.168.10.23) not reachable

PC2> ping 192.168.10.33

84 bytes from 192.168.10.33 icmp_seq=1 ttl=64 time=9.048 ms
84 bytes from 192.168.10.33 icmp_seq=2 ttl=64 time=6.944 ms
84 bytes from 192.168.10.33 icmp_seq=3 ttl=64 time=15.283 ms
84 bytes from 192.168.10.33 icmp_seq=4 ttl=64 time=5.839 ms
84 bytes from 192.168.10.33 icmp_seq=5 ttl=64 time=10.844 ms
```

PC5:

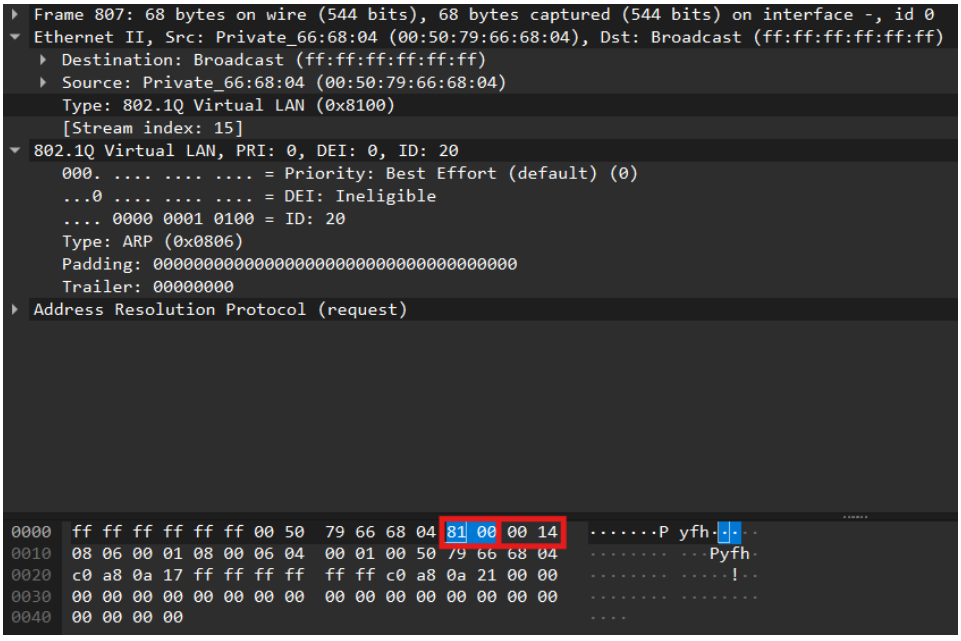
```
PC5> ping 192.168.10.21

84 bytes from 192.168.10.21 icmp_seq=1 ttl=64 time=12.310 ms
84 bytes from 192.168.10.21 icmp_seq=2 ttl=64 time=15.376 ms
84 bytes from 192.168.10.21 icmp_seq=3 ttl=64 time=9.866 ms
84 bytes from 192.168.10.21 icmp_seq=4 ttl=64 time=7.866 ms
84 bytes from 192.168.10.21 icmp_seq=5 ttl=64 time=4.049 ms

PC5> ping 192.168.10.31

host (192.168.10.31) not reachable

PC5> ping 192.168.10.22

84 bytes from 192.168.10.22 icmp_seq=1 ttl=64 time=6.351 ms
84 bytes from 192.168.10.22 icmp_seq=2 ttl=64 time=3.899 ms
84 bytes from 192.168.10.22 icmp_seq=3 ttl=64 time=4.216 ms
84 bytes from 192.168.10.22 icmp_seq=4 ttl=64 time=8.894 ms
84 bytes from 192.168.10.22 icmp_seq=5 ttl=64 time=17.362 ms

PC5> ping 192.168.10.32

host (192.168.10.32) not reachable

PC5> ping 192.168.10.33

host (192.168.10.33) not reachable

PC5>
```

По результатам можно заметить, что все работает корректно, и ПК, находящиеся в одинаковых VLAN, могут связаться друг с другом.

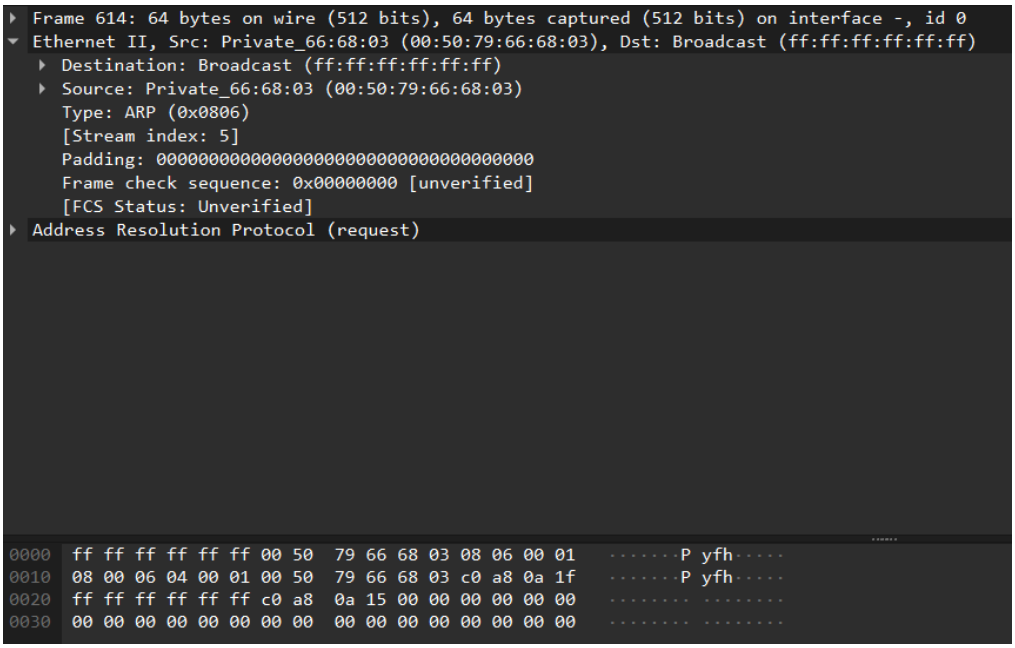
Для просмотра тегированного трафика был рассмотрен линк между Layer2Switch-1 и Layer2Switch-3:

```
Link from Layer2Switch-1 port Ethernet2 to Layer2Switch-3 port Ethernet0
Packet capture is active
```

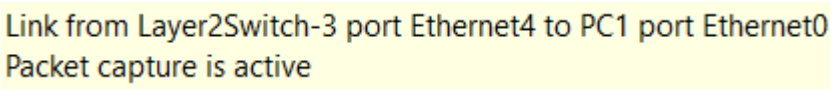
Для vlan 20 ARP запросы тегируются и добавляется 4 дополнительных байта. Два байта (81 00) указывают на наличие 802.1Q тега. Потом идут 3 бита PRI (000), 1 бит DEI (0) и 12 бит VLAN ID (0000 0001 0100).



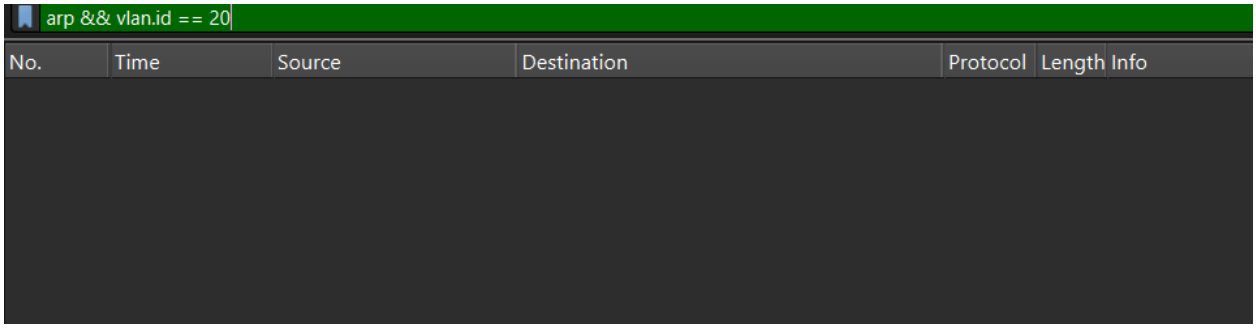
Для vlan 333 тэги к ARP запросам не добавляются.



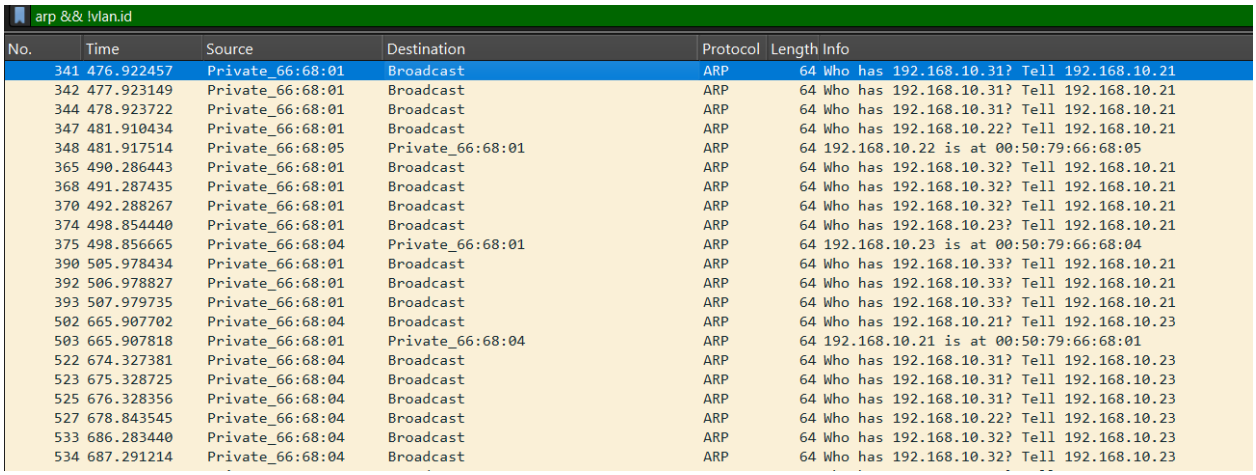
Далее был рассмотрен линк между Layer2Switch-3 и PC1:



Тегированного графика вообще нет:



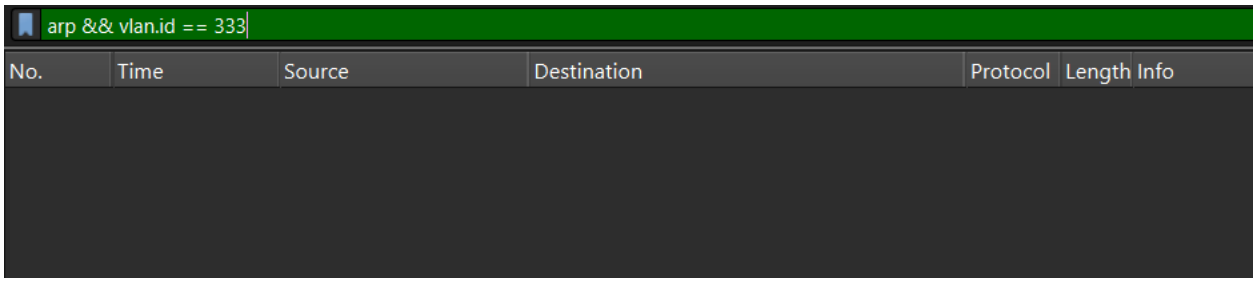
Весь трафик без тегов, т.к. коммутатор их удаляет перед отправкой на ПК:

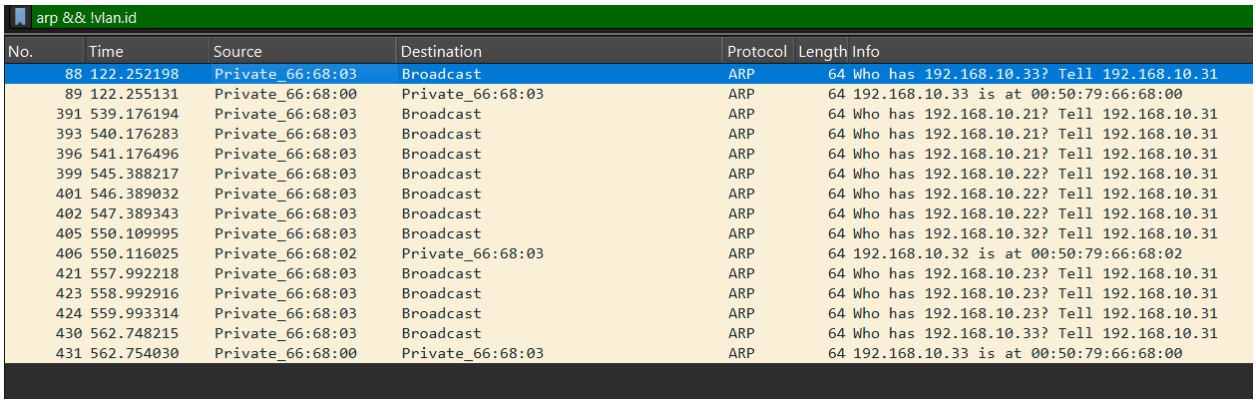


Также был рассмотрен линк между Layer2Switch-3 и PC2:

```
Link from Layer2Switch-3 port Ethernet5 to PC2 port Ethernet0
Packet capture is active
```

Здесь были получены аналогичные результаты:





No.	Time	Source	Destination	Protocol	Length	Info
88	122.252198	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.33? Tell 192.168.10.31
89	122.255131	Private_66:68:00	Private_66:68:03	ARP	64	192.168.10.33 is at 00:50:79:66:68:00
391	539.176194	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.21? Tell 192.168.10.31
393	540.176283	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.21? Tell 192.168.10.31
396	541.176496	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.21? Tell 192.168.10.31
399	545.388217	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.22? Tell 192.168.10.31
401	546.389032	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.22? Tell 192.168.10.31
402	547.389343	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.22? Tell 192.168.10.31
405	550.109995	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.32? Tell 192.168.10.31
406	550.116025	Private_66:68:02	Private_66:68:03	ARP	64	192.168.10.32 is at 00:50:79:66:68:02
421	557.992218	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.23? Tell 192.168.10.31
423	558.992916	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.23? Tell 192.168.10.31
424	559.993314	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.23? Tell 192.168.10.31
430	562.748215	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.10.33? Tell 192.168.10.31
431	562.754030	Private_66:68:00	Private_66:68:03	ARP	64	192.168.10.33 is at 00:50:79:66:68:00