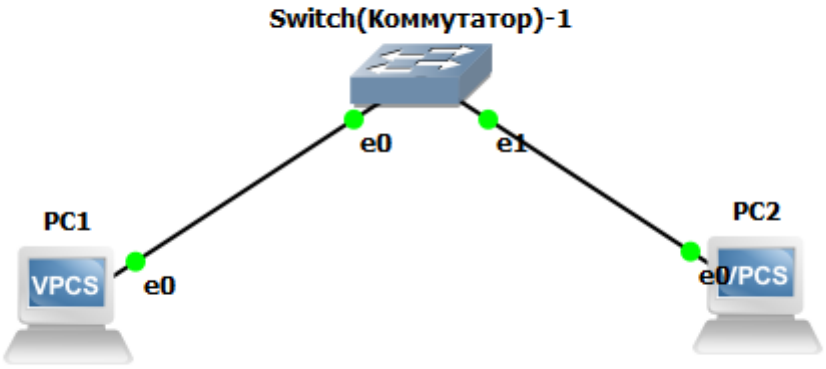
Лабораторная работа №1
Тема: Освоение инструментария для выполнения работ, построение простой сети

2) Создать простейшую сеть, состоящую из 1 коммутатора и 2 компьютеров, назначить им произвольные ip адреса из одной сети



Модель сети 1.

Смена адреса на PC1

PC1> ip 192.168.10.5 255.255.255.0
Checking for duplicate address...
PC1 : 192.168.10.5 255.255.255.0

PC1>

Смена адреса на PC2

PC2> ip 192.168.10.6 255.255.255.0
Checking for duplicate address...
PC2 : 192.168.10.6 255.255.255.0

PC2>

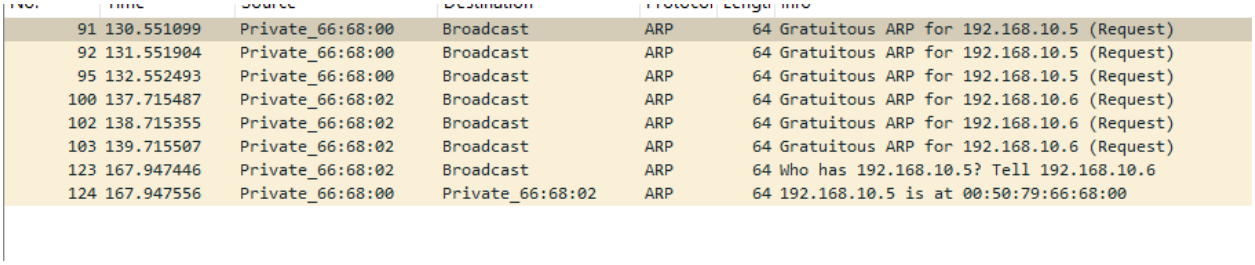
3) Запустить симуляцию, выполнить команду ping с одного из компьютеров, используя ip адрес второго компьютера

Выполнение команды ping с PC2 на PC1.

PC2> ping 192.168.10.5

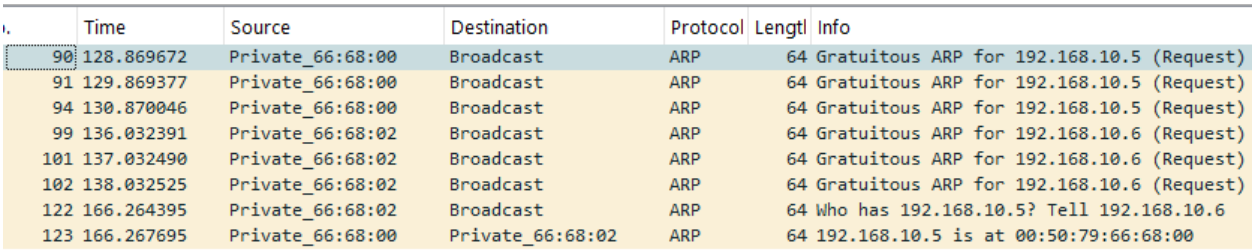
84 bytes from 192.168.10.5 icmp_seq=1 ttl=64 time=15.366 ms
84 bytes from 192.168.10.5 icmp_seq=2 ttl=64 time=0.626 ms
84 bytes from 192.168.10.5 icmp_seq=3 ttl=64 time=5.867 ms
84 bytes from 192.168.10.5 icmp_seq=4 ttl=64 time=0.588 ms
84 bytes from 192.168.10.5 icmp_seq=5 ttl=64 time=5.948 ms

4) Перехватить трафик протокола arp на всех линках(nb!), задокументировать и проанализировать заголовки пакетов в программе Wireshark, для фильтрации трафика, относящегося к указанному протоколу использовать фильтры Wireshark



No.	Time	Source	Destination	Protocol	Length	Info
91	130.551099	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.5 (Request)
92	131.551904	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.5 (Request)
95	132.552493	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.5 (Request)
100	137.715487	Private_66:68:02	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.6 (Request)
102	138.715355	Private_66:68:02	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.6 (Request)
103	139.715507	Private_66:68:02	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.6 (Request)
123	167.947446	Private_66:68:02	Broadcast	ARP	64	Who has 192.168.10.5? Tell 192.168.10.6
124	167.947556	Private_66:68:00	Private_66:68:02	ARP	64	192.168.10.5 is at 00:50:79:66:68:00

Пакеты arp с коммутатора на PC1



No.	Time	Source	Destination	Protocol	Length	Info
90	128.869672	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.5 (Request)
91	129.869377	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.5 (Request)
94	130.870046	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.5 (Request)
99	136.032391	Private_66:68:02	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.6 (Request)
101	137.032490	Private_66:68:02	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.6 (Request)
102	138.032525	Private_66:68:02	Broadcast	ARP	64	Gratuitous ARP for 192.168.10.6 (Request)
122	166.264395	Private_66:68:02	Broadcast	ARP	64	Who has 192.168.10.5? Tell 192.168.10.6
123	166.267695	Private_66:68:00	Private_66:68:02	ARP	64	192.168.10.5 is at 00:50:79:66:68:00

Пакеты arp с коммутатора на PC2

Пакет-запрос 122 на PC2

Address Resolution Protocol (request)
- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: request (1)
- Sender MAC address: Private_66:68:02 (00:50:79:66:68:02)
- Sender IP address: 192.168.10.6
- Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)
- Target IP address: 192.168.10.5

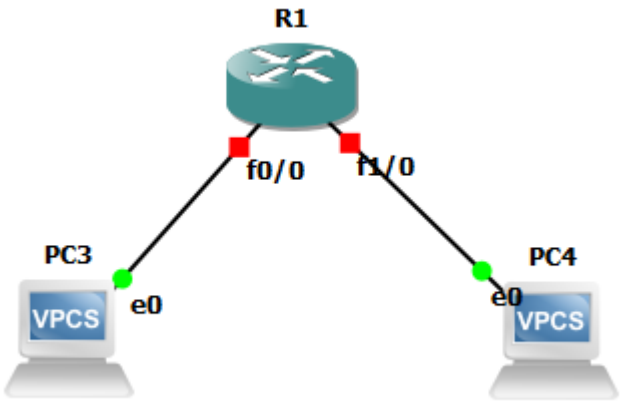
Пакет-ответ 123 на PC2

Address Resolution Protocol (reply)

Hardware type: Ethernet (1)
Protocol type: IPv4 (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: reply (2)
Sender MAC address: Private_66:68:00 (00:50:79:66:68:00)
Sender IP address: 192.168.10.5
Target MAC address: Private_66:68:02 (00:50:79:66:68:02)
Target IP address: 192.168.10.6

PC1 имеет MAC адрес: Private_66:68:00
PC2 имеет MAC адрес: Private_66:68:02

5) Создать простейшую сеть, состоящую из 1 маршрутизатора и 2 компьютеров, назначить им произвольные ip адреса из разных сетей



Модель сети 2

На маршрутизаторе

R1#enable
R1#conf
R1#configure cons
R1#configure ter
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface fastEthernet 0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:00:54.187: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state t
o up

*Mar 1 00:00:55.187: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to up
R1(config)#interface fastEthernet 1/0
R1(config-if)#ip address 192.168.2.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:01:09.555: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state t
o up
*Mar 1 00:01:10.555: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et1/0, changed state to up
R1(config)#ip rout
R1(config)#ip routing
R1(config)#ip routing
R1(config)#end
R1#
*Mar 1 00:01:27.051: %SYS-5-CONFIG_I: Configured from console by console
R1#writ
R1#write mem
R1#write memory
Building configuration...
[OK]
R1#

Ha PC3

PC3> show ip

NAME   : PC3[1]
IP/MASK   : 0.0.0.0/0
GATEWAY   : 0.0.0.0
DNS   :
MAC   : 00:50:79:66:68:01
LPORT   : 20054
RHOST:PORT : 127.0.0.1:20055
MTU   : 1500

PC3> ip 192.168.1.10 192.168.1.1 255.255.255.0
Invalid gateway address

PC3> ip 192.168.1.10 192.168.1.1 24
Checking for duplicate address...

PC3 : 192.168.1.10 255.255.255.0 gateway 192.168.1.1

PC3>
PC3> save
Saving startup configuration to startup.vpc
. done

На PC4

PC4> ip 192.168.2.10 192.168.2.1 24
Checking for duplicate address...
PC4 : 192.168.2.10 255.255.255.0 gateway 192.168.2.1
PC4>
PC4> save
Saving startup configuration to startup.vpc
. done

Проверка

R1#show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	192.168.1.1	YES	manual	up	up
FastEthernet1/0	192.168.2.1	YES	manual	up	up
Ethernet2/0	unassigned	YES	unset	administratively down	down
Ethernet2/1	unassigned	YES	unset	administratively down	down
Ethernet2/2	unassigned	YES	unset	administratively down	down
Ethernet2/3	unassigned	YES	unset	administratively down	down
Serial3/0	unassigned	YES	unset	administratively down	down
Serial3/1	unassigned	YES	unset	administratively down	down
Serial3/2	unassigned	YES	unset	administratively down	down
Serial3/3	unassigned	YES	unset	administratively down	down

R1#

PC3> show ip

NAME   : PC3[1]
IP/MASK   : 192.168.1.10/24
GATEWAY   : 192.168.1.1
DNS   :
MAC   : 00:50:79:66:68:01
LPORT   : 20054
RHOST:PORT : 127.0.0.1:20055
MTU   : 1500

PC4> show ip

NAME : PC4[1]
IP/MASK : 192.168.2.10/24
GATEWAY : 192.168.2.1
DNS :
MAC : 00:50:79:66:68:03
LPORT : 20056
RHOST:PORT : 127.0.0.1:20057
MTU : 1500

Проверка шлюзов

PC3> ping 192.168.1.1

84 bytes from 192.168.1.1 icmp_seq=1 ttl=255 time=9.310 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=255 time=5.871 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=255 time=5.546 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=255 time=5.285 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=255 time=6.084 ms

PC4> ping 192.168.2.1

84 bytes from 192.168.2.1 icmp_seq=1 ttl=255 time=9.784 ms
84 bytes from 192.168.2.1 icmp_seq=2 ttl=255 time=5.419 ms
84 bytes from 192.168.2.1 icmp_seq=3 ttl=255 time=5.100 ms
84 bytes from 192.168.2.1 icmp_seq=4 ttl=255 time=5.805 ms
84 bytes from 192.168.2.1 icmp_seq=5 ttl=255 time=5.641 ms

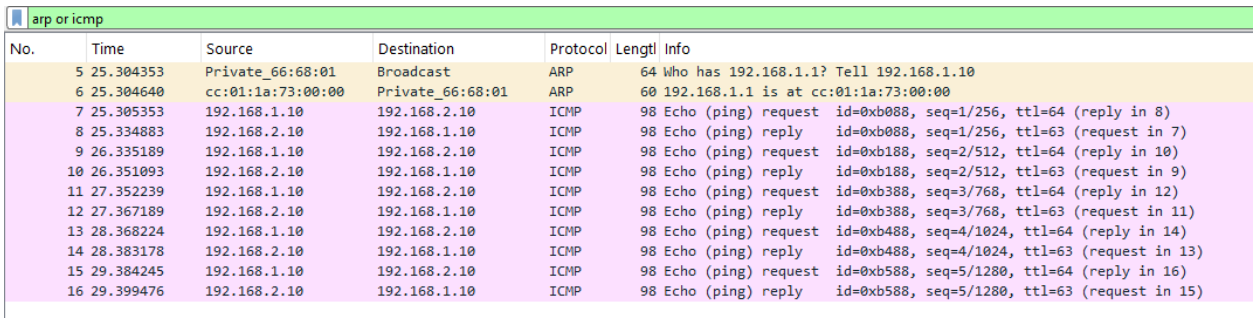
6) Запустить симуляцию, выполнить команду ping с одного из компьютеров, используя ip адрес второго компьютера

Пинг PC4 с PC3

PC3> ping 192.168.2.10

84 bytes from 192.168.2.10 icmp_seq=1 ttl=63 time=12.898 ms
84 bytes from 192.168.2.10 icmp_seq=2 ttl=63 time=15.194 ms
84 bytes from 192.168.2.10 icmp_seq=3 ttl=63 time=15.661 ms
84 bytes from 192.168.2.10 icmp_seq=4 ttl=63 time=15.821 ms
84 bytes from 192.168.2.10 icmp_seq=5 ttl=63 time=15.873 ms

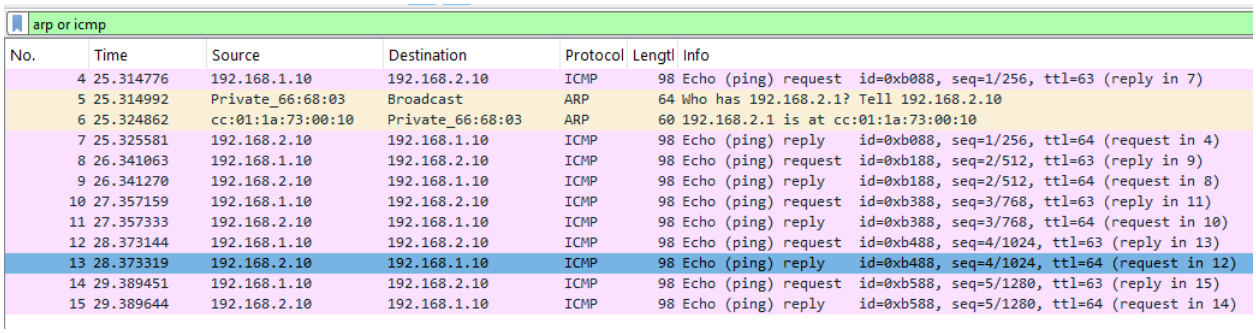
7) Перехватить трафик протокола arp и icmp на всех линках(nb!), задокументировать и проанализировать заголовки пакетов в программе Wireshark, для фильтрации трафика, относящегося к указанному протоколу использовать фильтры Wireshark



arp or icmp

No.	Time	Source	Destination	Protocol	Lengtl	Info
5	25.304353	Private_66:68:01	Broadcast	ARP	64	Who has 192.168.1.1? Tell 192.168.1.10
6	25.304640	cc:01:1a:73:00:00	Private_66:68:01	ARP	60	192.168.1.1 is at cc:01:1a:73:00:00
7	25.305353	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb088, seq=1/256, ttl=64 (reply in 8)
8	25.334883	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb088, seq=1/256, ttl=63 (request in 7)
9	26.335189	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb188, seq=2/512, ttl=64 (reply in 10)
10	26.351093	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb188, seq=2/512, ttl=63 (request in 9)
11	27.352239	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb388, seq=3/768, ttl=64 (reply in 12)
12	27.367189	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb388, seq=3/768, ttl=63 (request in 11)
13	28.368224	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb488, seq=4/1024, ttl=64 (reply in 14)
14	28.383178	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb488, seq=4/1024, ttl=63 (request in 13)
15	29.384245	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb588, seq=5/1280, ttl=64 (reply in 16)
16	29.399476	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb588, seq=5/1280, ttl=63 (request in 15)

Трафик на PC3



arp or icmp

No.	Time	Source	Destination	Protocol	Lengtl	Info
4	25.314776	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb088, seq=1/256, ttl=63 (reply in 7)
5	25.314992	Private_66:68:03	Broadcast	ARP	64	Who has 192.168.2.1? Tell 192.168.2.10
6	25.324862	cc:01:1a:73:00:10	Private_66:68:03	ARP	60	192.168.2.1 is at cc:01:1a:73:00:10
7	25.325581	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb088, seq=1/256, ttl=64 (request in 4)
8	26.341063	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb188, seq=2/512, ttl=63 (reply in 9)
9	26.341270	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb188, seq=2/512, ttl=64 (request in 8)
10	27.357159	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb388, seq=3/768, ttl=63 (reply in 11)
11	27.357333	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb388, seq=3/768, ttl=64 (request in 10)
12	28.373144	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb488, seq=4/1024, ttl=63 (reply in 13)
13	28.373319	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb488, seq=4/1024, ttl=64 (request in 12)
14	29.389451	192.168.1.10	192.168.2.10	ICMP	98	Echo (ping) request id=0xb588, seq=5/1280, ttl=63 (reply in 15)
15	29.389644	192.168.2.10	192.168.1.10	ICMP	98	Echo (ping) reply id=0xb588, seq=5/1280, ttl=64 (request in 14)

Трафик на PC4

Анализ пакета 4 на PC3.

Ethernet II, Src: cc:01:1a:73:00:10 (cc:01:1a:73:00:10), Dst: Private_66:68:03 (00:50:79:66:68:03)
    Destination: Private_66:68:03 (00:50:79:66:68:03)
    Source: cc:01:1a:73:00:10 (cc:01:1a:73:00:10)
    Type: IPv4 (0x0800)
    [Stream index: 1]
Internet Protocol Version 4, Src: 192.168.1.10, Dst: 192.168.2.10
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 84
    Identification: 0x88b0 (34992)
    000. .... = Flags: 0x0
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 63
    Protocol: ICMP (1)
    Header Checksum: 0x6e94 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.10
    Destination Address: 192.168.2.10
    [Stream index: 0]

cc:01:1a:73:00:10 – MAC адрес PC3

Private_66:68:03 (00:50:79:66:68:03) – MAC адрес шлюза маршрутизатора со стороны PC3.