ОТЧЕТ

по лабораторной работе №1

по дисциплине «Сети и телекоммуникации»

Тема: Настройка IP-адресов в сети

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Санкт-Петербург

2025

Цель работы.

Изучение и практическое освоение основ адресации, разрешения физических адресов и маршрутизации в IP-сетях.

Задание.

Вариант 22(8).

1. Исправить структуру сети (если это необходимо), обеспечив корректную доставку кадров на физическом уровне.

2. Задать IP-адреса, маски подсети и шлюзы по умолчанию для всех уз лов сети, чтобы обеспечить корректную доставку Echo-запроса от K1 к K2 и Echo-ответа обратно. Обосновать свои установки.

3. Выполнить Echo-запрос с K1 на K2. Посмотреть вывод программы.

4. Добавить статическую запись ARP для K3 на K1 (или для ближайшего к K1 маршрутизатора, находящегося между K3 и K1). Подождать устаревания ARP-таблиц и выполнить Echo-запрос с K1 на K3. Объяснить результат.

5. Выполнить Echo-запрос на IP-адрес 200.100.0.1 с K1. Объяснить вы вод программы.

6. Выполнить Echo-запросы с K1 и K2 на все узлы сети. Убедиться, что Echo-ответы приходят.

В отчет необходимо включить схему сети, настройки протокола TCP/IP для всех узлов сети и результаты вывода программы, полученные при выполнении Echo-запросов.

Файл со схемой сети: lab1_var8.jfst. Сеть между маршрутизаторами R1 и ADSL: 192.168.0.0. Компьютер Station1 имеет IP-адрес 192.168.1.2. Компьютер Remote1 имеет IP-адрес 99.11.0.11. Сеть между маршрутизаторами ADSL и ADSL2: 172.168.0.0. Обозначения в задании: K1 – Station1, K2 – Remote1, K3 – Station2.
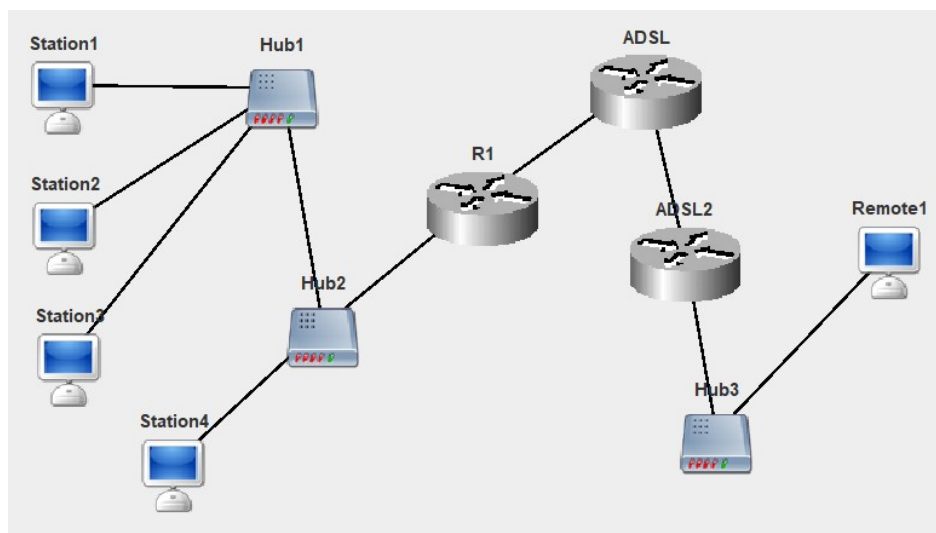
Схема сети приведена на рис.1.

Рисунок 1 – Схема сети.

Выполнение работы.

1. Структура сети не нуждается в изменении.

2. Настройки узлов сети приведены в табл.1.

Таблица 1 – Настройки сети.

Узел	Интерфейс	IP-адрес	Маска	Шлюз по умолчанию
K1(Station1)	eth0	192.168.1.2	255.255.255.0/24	192.168.1.1
K2(Remote1)	eth0	99.11.0.11	255.255.255.0/24	99.11.0.10
K3(Station2)	eth0	192.168.1.3	255.255.255.0/24	192.168.1.1
Station3	eth0	192.168.1.4	255.255.255.0/24	192.168.1.1
Station4	eth0	192.168.1.5	255.255.255.0/24	192.168.1.1
R1	eth0	192.168.1.1	255.255.255.0/24	192.168.0.2
R1	eth1	192.168.0.1	255.255.255.0/2	

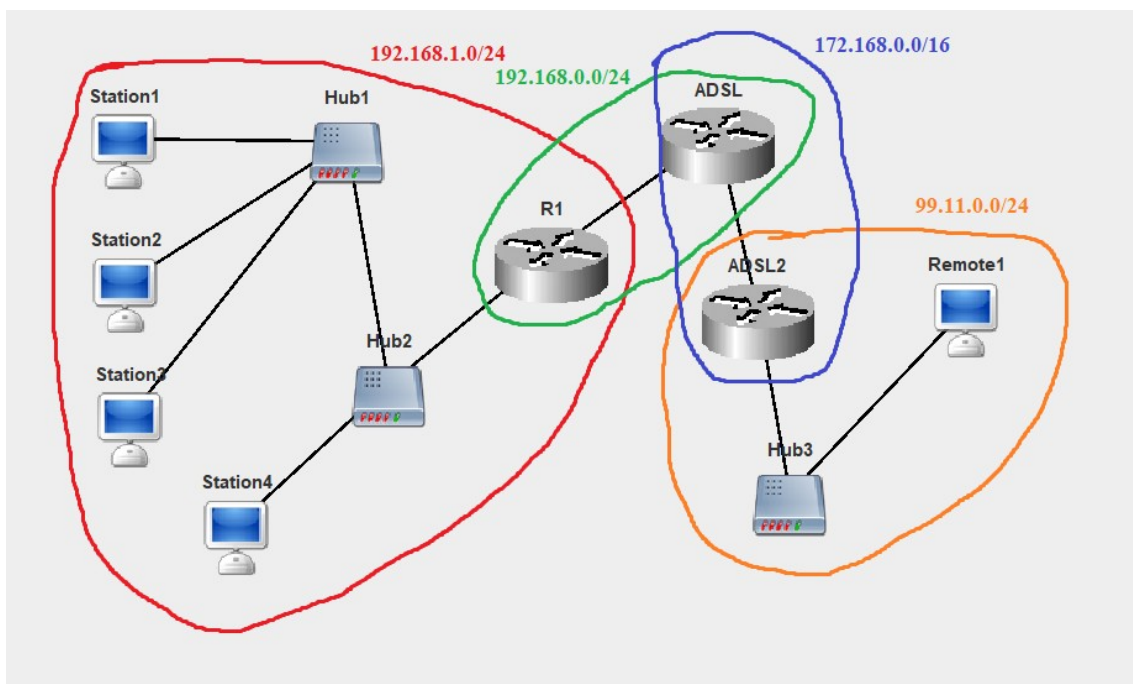|			4	
ADSL	eth0	192.168.0.2	255.255.255.0/2 4	172.168.0.2
ADSL	eth1	172.168.0.1	255.255.0.0/16	
ADSL2	eth0	172.168.0.2	255.255.0.0/16	172.168.0.1
ADSL2	eth1	99.11.0.10	255.255.255.0/2 4	

Распределение сети на подсети приведено на рис.2.

Рисунок 2 – Распределение сети на подсети.

Для ADSL выставлен шлюз по умолчанию 172.168.0.2, кроме этого настроена таблица маршрутизации для обеспечения корректной доставки Echo-запроса(ответа) от K2(Remote1) к K1(Station1), путем действий в консоли:

ADSL# conf t

ADSL(config)# ip route 192.168.1.0 255.255.255.0 192.168.0.1 eth0

ADSL(config)# write mem

3. Логи выполнения Echo-запроса с K1(Station1) на K2(Remote1):

19:38:09-726 Station1 Echo Request Packet Network Created Echo Request packet to 99.11.0.11
19:38:09-727 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.1
19:38:09-727 Station1 ARP_packet Network Sending broadcast packet from ProtocolStack.

19:38:09-727 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C
19:38:09-727 Station4 Ethernet Packet Link Recieved and accepted packet at interface 89:C6:17:17:97:4D
19:38:09-727 Station4 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 R1 Ethernet Packet Link Recieved and accepted packet at interface 46:7A:43:16:3D:70
19:38:09-727 R1 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 R1 ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 R1 ARP Response Packet DataLink Created ARP Response packet to 192.168.1.2
19:38:09-727 R1 ARP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).
19:38:09-727 R1 Ethernet Packet Link Sending packet from interface 46:7A:43:16:3D:70
19:38:09-727 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
19:38:09-727 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
19:38:09-727 Station2 Ethernet Packet Link Recieved and dropped packet at interface 9E:59:46:6E:80:62
19:38:09-727 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C
19:38:09-727 Station1 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 Station1 ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 Station3 Ethernet Packet Link Recieved and accepted packet at interface 5D:95:BF:1B:90:5D
19:38:09-727 Station3 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 Station2 Ethernet Packet Link Recieved and accepted packet at interface 9E:59:46:6E:80:62
19:38:09-727 Station2 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).
19:38:09-727 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C
19:38:09-727 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
19:38:09-727 R1 Ethernet Packet Link Recieved and accepted packet at interface 46:7A:43:16:3D:70
19:38:09-727 R1 ICMP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 R1 ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
19:38:09-727 R1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.0.2
19:38:09-727 R1 ARP_packet Network Sending broadcast packet from ProtocolStack.
19:38:09-727 R1 Ethernet Packet Link Sending packet from interface AF:48:44:5F:8C:5D
19:38:09-727 ADSL Ethernet Packet Link Recieved and accepted packet at interface 6E:59:2D:36:BB:21
19:38:09-727 ADSL ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 ADSL ARP Response Packet DataLink Created ARP Response packet to 192.168.0.1
19:38:09-727 ADSL ARP_packet Network Sending packet from ProtocolStack (to 192.168.0.1).
19:38:09-727 ADSL Ethernet Packet Link Sending packet from interface 6E:59:2D:36:BB:21
19:38:09-727 R1 Ethernet Packet Link Recieved and accepted packet at interface AF:48:44:5F:8C:5D
19:38:09-727 R1 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 R1 ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 R1 ICMP_packet Network Forwarding packet from ProtocolStack(to 192.168.0.2).
19:38:09-727 R1 Ethernet Packet Link Sending packet from interface AF:48:44:5F:8C:5D
19:38:09-727 ADSL Ethernet Packet Link Recieved and accepted packet at interface 6E:59:2D:36:BB:21
19:38:09-727 ADSL ICMP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
19:38:09-727 ADSL ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 172.168.0.2
19:38:09-727 ADSL ARP_packet Network Sending broadcast packet from ProtocolStack.
19:38:09-727 ADSL Ethernet Packet Link Sending packet from interface 46:7C:99:33:A5:60
19:38:09-727 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 8B:6A:A2:2C:C0:2F
19:38:09-727 ADSL2 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL2 ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 ADSL2 ARP Response Packet DataLink Created ARP Response packet to 172.168.0.1
19:38:09-727 ADSL2 ARP_packet Network Sending packet from ProtocolStack (to 172.168.0.1).
19:38:09-727 ADSL2 Ethernet Packet Link Sending packet from interface 8B:6A:A2:2C:C0:2F
19:38:09-727 ADSL Ethernet Packet Link Recieved and accepted packet at interface 46:7C:99:33:A5:60
19:38:09-727 ADSL ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 ADSL ICMP_packet Network Forwarding packet from ProtocolStack(to 172.168.0.2).
19:38:09-727 ADSL Ethernet Packet Link Sending packet from interface 46:7C:99:33:A5:60
19:38:09-727 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 8B:6A:A2:2C:C0:2F
19:38:09-727 ADSL2 ICMP_packet Network ProtocolStack received packet from local Interface.
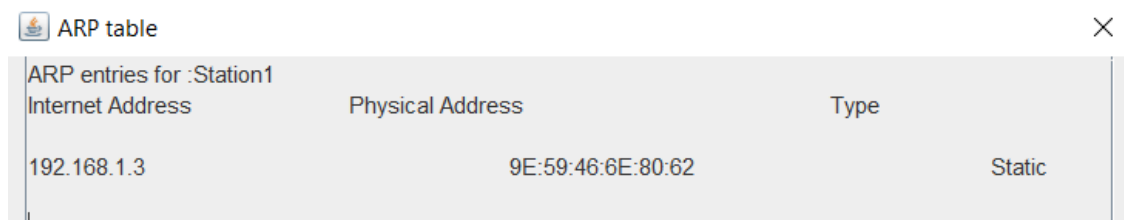
19:38:09-727 ADSL2 ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
19:38:09-727 ADSL2 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 99.11.0.11
19:38:09-727 ADSL2 ARP_packet Network Sending broadcast packet from ProtocolStack.
19:38:09-727 ADSL2 Ethernet Packet Link Sending packet from interface 82:B5:43:80:64:55
19:38:09-727 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A
19:38:09-727 Remote1 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 Remote1 ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 Remote1 ARP Response Packet DataLink Created ARP Response packet to 99.11.0.10
19:38:09-727 Remote1 ARP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).
19:38:09-727 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A
19:38:09-727 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 82:B5:43:80:64:55
19:38:09-727 ADSL2 ARP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL2 ARP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 ADSL2 ICMP_packet Network Forwarding packet from ProtocolStack(to 99.11.0.11).
19:38:09-727 ADSL2 Ethernet Packet Link Sending packet from interface 82:B5:43:80:64:55
19:38:09-727 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A
19:38:09-727 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 Remote1 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2
19:38:09-727 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).
19:38:09-727 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A
19:38:09-727 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 82:B5:43:80:64:55
19:38:09-727 ADSL2 ICMP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL2 ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
19:38:09-727 ADSL2 ICMP_packet Network Forwarding packet from ProtocolStack(to 172.168.0.1).
19:38:09-727 ADSL2 Ethernet Packet Link Sending packet from interface 8B:6A:A2:2C:C0:2F
19:38:09-727 ADSL Ethernet Packet Link Recieved and accepted packet at interface 46:7C:99:33:A5:60
19:38:09-727 ADSL ICMP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 ADSL ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
19:38:09-727 ADSL ICMP_packet Network Forwarding packet from ProtocolStack(to 192.168.0.1).
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19:38:09-727 R1 ICMP_packet Network Forwarding packet from ProtocolStack(to 192.168.1.2).
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19:38:09-727 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
19:38:09-727 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
19:38:09-727 Station2 Ethernet Packet Link Recieved and dropped packet at interface 9E:59:46:6E:80:62
19:38:09-727 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C
19:38:09-727 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.
19:38:09-727 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
19:38:09-727 Station1 Echo Reply Packet Network Echo reply packet received from 99.11.0.11
19:38:09-727 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
19:38:09-727 Station2 Ethernet Packet Link Recieved and dropped packet at interface 9E:59:46:6E:80:62

4. Логи выполнения Echo-запроса от K1(Station1) к K3(Station2) до добавления статической записи ARP:

20:15:33-082 Station1 Echo Request Packet Network Created Echo Request packet to 192.168.1.3
20:15:33-082 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.3
20:15:33-082 Station1 ARP_packet Network Sending broadcast packet from ProtocolStack.
20:15:33-082 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C

20:15:33-082 Station4 Ethernet Packet Link Recieved and accepted packet at interface 89:C6:17:17:97:4D
20:15:33-082 Station4 ARP_packet Network ProtocolStack received packet from local Interface.
20:15:33-082 R1 Ethernet Packet Link Recieved and accepted packet at interface 46:7A:43:16:3D:70
20:15:33-082 R1 ARP_packet Network ProtocolStack received packet from local Interface.
20:15:33-082 Station3 Ethernet Packet Link Recieved and accepted packet at interface 5D:95:BF:1B:90:5D
20:15:33-082 Station3 ARP_packet Network ProtocolStack received packet from local Interface.
20:15:33-082 Station2 Ethernet Packet Link Recieved and accepted packet at interface 9E:59:46:6E:80:62
20:15:33-082 Station2 ARP_packet Network ProtocolStack received packet from local Interface.
20:15:33-082 Station2 ARP_packet Network Confirmed Packet is for this Network Layer Device.
20:15:33-082 Station2 ARP Response Packet DataLink Created ARP Response packet to 192.168.1.2
20:15:33-082 Station2 ARP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).
20:15:33-082 Station2 Ethernet Packet Link Sending packet from interface 9E:59:46:6E:80:62
20:15:33-082 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
20:15:33-082 R1 Ethernet Packet Link Recieved and dropped packet at interface 46:7A:43:16:3D:70
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20:15:33-082 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C
20:15:33-082 Station1 ARP_packet Network ProtocolStack received packet from local Interface.
20:15:33-082 Station1 ARP_packet Network Confirmed Packet is for this Network Layer Device.
20:15:33-082 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.3).
20:15:33-082 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C
20:15:33-082 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
20:15:33-082 R1 Ethernet Packet Link Recieved and dropped packet at interface 46:7A:43:16:3D:70
20:15:33-082 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
20:15:33-082 Station2 Ethernet Packet Link Recieved and accepted packet at interface 9E:59:46:6E:80:62
20:15:33-082 Station2 ICMP_packet Network ProtocolStack received packet from local Interface.
20:15:33-082 Station2 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
20:15:33-082 Station2 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2
20:15:33-082 Station2 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).
20:15:33-082 Station2 Ethernet Packet Link Sending packet from interface 9E:59:46:6E:80:62
20:15:33-082 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
20:15:33-082 R1 Ethernet Packet Link Recieved and dropped packet at interface 46:7A:43:16:3D:70
20:15:33-083 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
20:15:33-083 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C
20:15:33-083 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.
20:15:33-083 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
20:15:33-083 Station1 Echo Reply Packet Network Echo reply packet received from 192.168.1.3

Выполнено добавление статической ARP записи на K1(Station1) о K3(Station2). Запись показана на рис.3.

Рисунок 3 – Добавленная статическая запись ARP.

Логи выполнения Echo-запроса от K1(Station1) к K3(Station2) после добавления статической записи ARP.

20:41:22-284 Station1 Echo Request Packet Network Created Echo Request packet to 192.168.1.3
20:41:22-284 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.3).
20:41:22-284 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C
20:41:22-284 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
20:41:22-284 R1 Ethernet Packet Link Recieved and dropped packet at interface 46:7A:43:16:3D:70
20:41:22-284 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
20:41:22-284 Station2 Ethernet Packet Link Recieved and accepted packet at interface 9E:59:46:6E:80:62
20:41:22-284 Station2 ICMP_packet Network ProtocolStack received packet from local Interface.

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20:41:22-284 Station2 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
20:41:22-284 Station2 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2
20:41:22-284 Station2 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.2
20:41:22-285 Station2 ARP_packet Network Sending broadcast packet from ProtocolStack.
20:41:22-285 Station2 Ethernet Packet Link Sending packet from interface 9E:59:46:6E:80:62
20:41:22-285 Station4 Ethernet Packet Link Recieved and accepted packet at interface 89:C6:17:17:97:4D
20:41:22-285 Station4 ARP_packet Network ProtocolStack received packet from local Interface.
20:41:22-285 R1 Ethernet Packet Link Recieved and accepted packet at interface 46:7A:43:16:3D:70
20:41:22-285 R1 ARP_packet Network ProtocolStack received packet from local Interface.
20:41:22-285 Station3 Ethernet Packet Link Recieved and accepted packet at interface 5D:95:BF:1B:90:5D
20:41:22-285 Station3 ARP_packet Network ProtocolStack received packet from local Interface.
20:41:22-285 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C
20:41:22-285 Station1 ARP_packet Network ProtocolStack received packet from local Interface.
20:41:22-285 Station1 ARP_packet Network Confirmed Packet is for this Network Layer Device.
20:41:22-285 Station1 ARP Response Packet DataLink Created ARP Response packet to 192.168.1.3
20:41:22-285 Station1 ARP_packet Network Sending packet from ProtocolStack (to 192.168.1.3).
20:41:22-285 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C
20:41:22-285 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
20:41:22-285 R1 Ethernet Packet Link Recieved and dropped packet at interface 46:7A:43:16:3D:70
20:41:22-285 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
20:41:22-285 Station2 Ethernet Packet Link Recieved and accepted packet at interface 9E:59:46:6E:80:62
20:41:22-285 Station2 ARP_packet Network ProtocolStack received packet from local Interface.
20:41:22-285 Station2 ARP_packet Network Confirmed Packet is for this Network Layer Device.
20:41:22-285 Station2 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).
20:41:22-285 Station2 Ethernet Packet Link Sending packet from interface 9E:59:46:6E:80:62
20:41:22-286 Station4 Ethernet Packet Link Recieved and dropped packet at interface 89:C6:17:17:97:4D
20:41:22-286 R1 Ethernet Packet Link Recieved and dropped packet at interface 46:7A:43:16:3D:70
20:41:22-286 Station3 Ethernet Packet Link Recieved and dropped packet at interface 5D:95:BF:1B:90:5D
20:41:22-286 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C
20:41:22-286 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.
20:41:22-286 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
20:41:22-286 Station1 Echo Reply Packet Network Echo reply packet received from 192.168.1.3

Для выполнения Echo-запроса с K1(Station1) на K2(Station2) отправителю нужен MAC-адрес получателя. Так как отправитель его не знает, он создает ARP-запрос, который является широковещательным, вследствие чего все узлы подсети должны обработать его. Благодаря этому находится получатель и отправляет ARP-ответ отправителю, но уже не широковещательно, а целенаправленно на MAC-адрес отправителя. Когда отправитель узнал MAC-адрес получателя, он создает ICMP Echo-запрос с указанием MAC-адреса получателя. Так как в сети используются hub'ы, они при получении сигнала берут и повторяют его на все остальные порты, вследствие чего сигнал доходит до всех узлов подсети. Но так как в запросе прописан MAC-адрес получателя, каждый узел сравнивает его со своим и отбрасывает запрос, если они не сошлись, либо же принимает его в противном случае. После чего от K2(Station2) поступает ICMP echo-ответ таким же образом.

После добавления статической записи ARP в K1(Station1) о K3(Station2), K1(Station1) при выполнении Echo-запроса на K3(Station2) заранее знает MAC-адрес получателя, вследствие чего сразу отправляет ICMP-echo запрос получателю. K3(Station2) получает запрос, но не может сразу ответить на него, так как не знает MAC-адреса отправителя. Поэтому K3(Station2) инициализирует широковещательный ARP-запрос. После получения MAC-адреса, куда нужно доставить Echo-ответ, он создает ICMP Echo-ответ и отправляет его на K1(Station1).

5. Логи выполнения Echo-запроса с K1(Station1) на IP-адрес 200.100.0.1.

21:13:37-724 Station1 Echo Request Packet Network Created Echo Request packet to 200.100.0.1
21:13:37-725 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.1
21:13:37-725 Station1 ARP_packet Network Sending broadcast packet from ProtocolStack.
21:13:37-725 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C

…
21:13:37-727 ADSL ARP_packet Network Sending broadcast packet from ProtocolStack.
21:13:37-727 ADSL Ethernet Packet Link Sending packet from interface 46:7C:99:33:A5:60
21:13:37-727 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 8B:6A:A2:2C:C0:2F
21:13:37-727 ADSL2 ARP_packet Network ProtocolStack received packet from local Interface.
21:13:37-727 ADSL2 ARP_packet Network Confirmed Packet is for this Network Layer Device.
21:13:37-727 ADSL2 ARP Response Packet DataLink Created ARP Response packet to 172.168.0.1
21:13:37-727 ADSL2 ARP_packet Network Sending packet from ProtocolStack (to 172.168.0.1).
21:13:37-727 ADSL2 Ethernet Packet Link Sending packet from interface 8B:6A:A2:2C:C0:2F
21:13:37-727 ADSL Ethernet Packet Link Recieved and accepted packet at interface 46:7C:99:33:A5:60
21:13:37-727 ADSL ARP_packet Network ProtocolStack received packet from local Interface.
21:13:37-727 ADSL ARP_packet Network Confirmed Packet is for this Network Layer Device.
21:13:37-727 ADSL ICMP_packet Network Forwarding packet from ProtocolStack(to 172.168.0.2).
21:13:37-727 ADSL Ethernet Packet Link Sending packet from interface 46:7C:99:33:A5:60
21:13:37-727 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 8B:6A:A2:2C:C0:2F
21:13:37-727 ADSL2 ICMP_packet Network ProtocolStack received packet from local Interface.
21:13:37-727 ADSL2 ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
21:13:37-727 ADSL2 ICMP_packet Network Forwarding packet from ProtocolStack(to 172.168.0.1).
21:13:37-727 ADSL2 Ethernet Packet Link Sending packet from interface 8B:6A:A2:2C:C0:2F

…
21:13:37-757 ADSL Ethernet Packet Link Sending packet from interface 46:7C:99:33:A5:60
21:13:37-757 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 8B:6A:A2:2C:C0:2F
21:13:37-757 ADSL2 ICMP_packet Network ProtocolStack received packet from local Interface.
21:13:37-757 ADSL2 ICMP_packet Network Packet Dropped: Hop count exceeded.
Host 200.100.0.1 Unreachable
21:13:37-757 ADSL2 ICMP Time Exceeded Network Sending ICMP Time Exceeded to 192.168.1.2
21:13:37-757 ADSL2 ICMP_packet Network Sending packet from ProtocolStack (to 172.168.0.1).
21:13:37-757 ADSL2 Ethernet Packet Link Sending packet from interface 8B:6A:A2:2C:C0:2F
21:13:37-757 ADSL Ethernet Packet Link Recieved and accepted packet at interface 46:7C:99:33:A5:60
21:13:37-757 ADSL ICMP_packet Network ProtocolStack received packet from local Interface.
21:13:37-757 ADSL ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
21:13:37-757 ADSL ICMP_packet Network Forwarding packet from ProtocolStack(to 192.168.0.1).
21:13:37-757 ADSL Ethernet Packet Link Sending packet from interface 6E:59:2D:36:BB:21
21:13:37-757 R1 Ethernet Packet Link Recieved and accepted packet at interface AF:48:44:5F:8C:5D

21:13:37-757 R1 ICMP_packet Network ProtocolStack received packet from local Interface.
21:13:37-757 R1 ICMP_packet Network Packet Received: Network Layer Device is Routable forwarding packet.
21:13:37-757 R1 ICMP_packet Network Forwarding packet from ProtocolStack(to 192.168.1.2).
21:13:37-757 R1 Ethernet Packet Link Sending packet from interface 46:7A:43:16:3D:70
21:13:37-757 Station4 Ethernet Packet Link Received and dropped packet at interface 89:C6:17:17:97:4D
21:13:37-757 Station3 Ethernet Packet Link Received and dropped packet at interface 5D:95:BF:1B:90:5D
21:13:37-757 Station2 Ethernet Packet Link Received and dropped packet at interface 9E:59:46:6E:80:62
21:13:37-757 Station1 Ethernet Packet Link Received and accepted packet at interface 78:77:A3:5F:1F:7C
21:13:37-757 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.
21:13:37-757 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.
21:13:37-757 Station1 ICMP Time Exceeded Network Recieved ICMP Time Exceeded from 172.168.0.2

Можно заметить, что передача зациклилась, из-за того, что ни один из маршрутизаторов не имел шлюза для сети, содержащей отправленный IP-адрес, вследствие чего они передавали пакет по шлюзам по умолчанию (которые у ADSL и ADSL2 указывают друг на друга). После перепосланий пакета значение его TTL(Time To Live) достигло нуля, вследствие чего ADSL2 не имеет права отсылать его дальше, поэтому отправляет обратно отправителю исходного пакета сообщение ICMP Time Exceeded.

6. Выполнение Echo-запросов с K1(Station1) и K2(Remote1) на все узлы сети:

- Логи выполнения Echo-запроса с K1(Station1) на Station3.

21:32:01-027 Station1 Echo Request Packet Network Created Echo Request packet to 192.168.1.4

21:32:01-027 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.4).

...

21:32:01-027 Station3 Ethernet Packet Link Recieved and accepted packet at interface 5D:95:BF:1B:90:5D

21:32:01-027 Station3 ICMP_packet Network ProtocolStack received packet from local Interface.

21:32:01-027 Station3 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:32:01-027 Station3 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2

21:32:01-027 Station3 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).

21:32:01-027 Station3 Ethernet Packet Link Sending packet from interface 5D:95:BF:1B:90:5D

...

21:32:01-027 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C

21:32:01-027 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:32:01-027 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:32:01-027 Station1 Echo Reply Packet Network Echo reply packet received from 192.168.1.4

- Логи выполнения Echo-запроса с K1(Station1) на Station4.

21:34:39-710 Station1 Echo Request Packet Network Created Echo Request packet to 192.168.1.5

21:34:39-710 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.5

…

21:34:39-711 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.5).

21:34:39-711 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C

...

21:34:39-711 Station4 Ethernet Packet Link Recieved and accepted packet at interface 89:C6:17:17:97:4D

21:34:39-711 Station4 ICMP_packet Network ProtocolStack received packet from local Interface.

21:34:39-711 Station4 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:34:39-711 Station4 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2

21:34:39-711 Station4 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).

21:34:39-711 Station4 Ethernet Packet Link Sending packet from interface 89:C6:17:17:97:4D

...

21:34:39-711 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C

21:34:39-711 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:34:39-711 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:34:39-711 Station1 Echo Reply Packet Network Echo reply packet received from 192.168.1.5

- Логи выполнения Echo-запроса с K1(Station1) на R1.

21:38:26-648 Station1 Echo Request Packet Network Created Echo Request packet to 192.168.1.1

21:38:26-648 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.1

...

21:38:26-648 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).

21:38:26-648 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C

...

21:38:26-648 R1 Ethernet Packet Link Recieved and accepted packet at interface 46:7A:43:16:3D:70

21:38:26-648 R1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:38:26-648 R1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:38:26-648 R1 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2

21:38:26-648 R1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.2).

21:38:26-648 R1 Ethernet Packet Link Sending packet from interface 46:7A:43:16:3D:70

...

21:38:26-648 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C

21:38:26-648 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:38:26-648 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:38:26-648 Station1 Echo Reply Packet Network Echo reply packet received from 192.168.1.1

- Логи выполнения Echo-запроса с K1(Station1) на ADSL

21:44:35-931 Station1 Echo Request Packet Network Created Echo Request packet to 192.168.0.2

21:44:35-931 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.1

...

21:44:35-932 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).

21:44:35-932 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C

...

21:44:35-932 ADSL Ethernet Packet Link Recieved and accepted packet at interface 6E:59:2D:36:BB:21

21:44:35-932 ADSL ICMP_packet Network ProtocolStack received packet from local Interface.

21:44:35-932 ADSL ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:44:35-932 ADSL Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2

21:44:35-932 ADSL ICMP_packet Network Sending packet from ProtocolStack (to 192.168.0.1).

21:44:35-932 ADSL Ethernet Packet Link Sending packet from interface 6E:59:2D:36:BB:21

...

21:44:35-932 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C

21:44:35-932 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:44:35-932 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:44:35-932 Station1 Echo Reply Packet Network Echo reply packet received from 192.168.0.2

- ### Логи выполнения Echo-запроса с K1(Station1) на ADSL2.

21:46:59-555 Station1 Echo Request Packet Network Created Echo Request packet to 172.168.0.2

21:46:59-555 Station1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 192.168.1.1

...

21:46:59-555 Station1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).

21:46:59-555 Station1 Ethernet Packet Link Sending packet from interface 78:77:A3:5F:1F:7C

...

21:46:59-555 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 8B:6A:A2:2C:C0:2F

21:46:59-555 ADSL2 ICMP_packet Network ProtocolStack received packet from local Interface.

21:46:59-555 ADSL2 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:46:59-555 ADSL2 Echo Reply Packet Network Created Echo Reply packet to 192.168.1.2

21:46:59-555 ADSL2 ICMP_packet Network Sending packet from ProtocolStack (to 172.168.0.1).

21:46:59-555 ADSL2 Ethernet Packet Link Sending packet from interface 8B:6A:A2:2C:C0:2F

...

21:46:59-555 Station1 Ethernet Packet Link Recieved and accepted packet at interface 78:77:A3:5F:1F:7C

21:46:59-555 Station1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:46:59-555 Station1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:46:59-555 Station1 Echo Reply Packet Network Echo reply packet received from 172.168.0.2

- ### Логи выполнения Echo-запроса с K2(Remote1) на ADSL2.

21:51:05-381 Remote1 Echo Request Packet Network Created Echo Request packet to 99.11.0.10

21:51:05-381 Remote1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 99.11.0.10

...

21:51:05-381 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).

21:51:05-381 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A

21:51:05-381 ADSL2 Ethernet Packet Link Recieved and accepted packet at interface 82:B5:43:80:64:55

21:51:05-381 ADSL2 ICMP_packet Network ProtocolStack received packet from local Interface.

21:51:05-381 ADSL2 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:51:05-381 ADSL2 Echo Reply Packet Network Created Echo Reply packet to 99.11.0.11

21:51:05-381 ADSL2 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.11).

21:51:05-381 ADSL2 Ethernet Packet Link Sending packet from interface 82:B5:43:80:64:55

21:51:05-381 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A

21:51:05-381 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:51:05-381 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:51:05-381 Remote1 Echo Reply Packet Network Echo reply packet received from 99.11.0.10

- Логи выполнения Echo-запроса с K2(Remote1) на ADSL.

21:52:09-719 Remote1 Echo Request Packet Network Created Echo Request packet to 172.168.0.1

21:52:09-719 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).

...

21:52:09-719 ADSL Ethernet Packet Link Recieved and accepted packet at interface 46:7C:99:33:A5:60

21:52:09-719 ADSL ICMP_packet Network ProtocolStack received packet from local Interface.

21:52:09-719 ADSL ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:52:09-719 ADSL Echo Reply Packet Network Created Echo Reply packet to 99.11.0.11

21:52:09-719 ADSL ICMP_packet Network Sending packet from ProtocolStack (to 172.168.0.2).

21:52:09-720 ADSL Ethernet Packet Link Sending packet from interface 46:7C:99:33:A5:60

…

21:52:09-720 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A

21:52:09-720 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:52:09-720 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:52:09-720 Remote1 Echo Reply Packet Network Echo reply packet received from 172.168.0.1

- Логи выполнения Echo-запроса с K2(Remote1) на R1.

21:53:34-321 Remote1 Echo Request Packet Network Created Echo Request packet to 192.168.0.1

21:53:34-321 Remote1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 99.11.0.10

...

21:53:34-322 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).

21:53:34-322 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A

...

21:53:34-322 R1 Ethernet Packet Link Recieved and accepted packet at interface AF:48:44:5F:8C:5D

21:53:34-322 R1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:53:34-322 R1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:53:34-322 R1 Echo Reply Packet Network Created Echo Reply packet to 99.11.0.11

21:53:34-322 R1 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.0.2).

21:53:34-322 R1 Ethernet Packet Link Sending packet from interface AF:48:44:5F:8C:5D

…

21:53:34-322 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A

21:53:34-322 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:53:34-322 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:53:34-322 Remote1 Echo Reply Packet Network Echo reply packet received from 192.168.0.1

- ### Логи выполнения Echo-запроса с K2(Remote1) на Station4.

21:57:30-983 Remote1 Echo Request Packet Network Created Echo Request packet to 192.168.1.5

21:57:30-983 Remote1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 99.11.0.10

...

21:57:30-983 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).

21:57:30-983 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A

...

21:57:30-984 Station4 Ethernet Packet Link Recieved and accepted packet at interface 89:C6:17:17:97:4D

21:57:30-984 Station4 ICMP_packet Network ProtocolStack received packet from local Interface.

21:57:30-984 Station4 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:57:30-984 Station4 Echo Reply Packet Network Created Echo Reply packet to 99.11.0.11

21:57:30-984 Station4 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).

21:57:30-984 Station4 Ethernet Packet Link Sending packet from interface 89:C6:17:17:97:4D

...

21:57:30-984 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A

21:57:30-984 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:57:30-984 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:57:30-984 Remote1 Echo Reply Packet Network Echo reply packet received from 192.168.1.5

- ### Логи выполнения Echo-запроса с K2(Remote1) на Station3.

21:59:05-842 Remote1 Echo Request Packet Network Created Echo Request packet to 192.168.1.4

21:59:05-842 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).

21:59:05-842 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A

...

21:59:05-842 Station3 Ethernet Packet Link Recieved and accepted packet at interface 5D:95:BF:1B:90:5D

21:59:05-843 Station3 ICMP_packet Network ProtocolStack received packet from local Interface.

21:59:05-843 Station3 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:59:05-843 Station3 Echo Reply Packet Network Created Echo Reply packet to 99.11.0.11

21:59:05-843 Station3 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).

21:59:05-843 Station3 Ethernet Packet Link Sending packet from interface 5D:95:BF:1B:90:5D

...

21:59:05-843 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A

21:59:05-843 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.

21:59:05-843 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

21:59:05-843 Remote1 Echo Reply Packet Network Echo reply packet received from 192.168.1.4

- ### Логи выполнения Echo-запроса с K2(Remote1) на K3(Station2).

22:00:20-640 Remote1 Echo Request Packet Network Created Echo Request packet to 192.168.1.3

22:00:20-640 Remote1 ARP Discovery Packet DataLink Created ARP discovery packet to source MAC address for IP 99.11.0.10

...

22:00:20-640 Remote1 ICMP_packet Network Sending packet from ProtocolStack (to 99.11.0.10).

22:00:20-640 Remote1 Ethernet Packet Link Sending packet from interface 12:7E:7D:87:7E:8A

...

22:00:20-640 Station2 Ethernet Packet Link Recieved and accepted packet at interface 9E:59:46:6E:80:62

22:00:20-640 Station2 ICMP_packet Network ProtocolStack received packet from local Interface.

22:00:20-640 Station2 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

22:00:20-640 Station2 Echo Reply Packet Network Created Echo Reply packet to 99.11.0.11

22:00:20-640 Station2 ICMP_packet Network Sending packet from ProtocolStack (to 192.168.1.1).

22:00:20-640 Station2 Ethernet Packet Link Sending packet from interface 9E:59:46:6E:80:62

...

22:00:20-640 Remote1 Ethernet Packet Link Recieved and accepted packet at interface 12:7E:7D:87:7E:8A

22:00:20-640 Remote1 ICMP_packet Network ProtocolStack received packet from local Interface.

22:00:20-640 Remote1 ICMP_packet Network Confirmed Packet is for this Network Layer Device.

22:00:20-640 Remote1 Echo Reply Packet Network Echo reply packet received from 192.168.1.3

Из представленных логов видно, что Echo-запросы из K1(Station1) и K2(Remote1) доходят и возвращаются из всех узлов сети.

Выводы.

Была проделана работа по настройке сети, настройке таблицы маршрутизации. Было произведено сравнение выполнения Echo-запроса без статической записи ARP у отправителя и с ней. Проверена достижимость всех узлов сети из K1(Station1) и K2(Remote1).