МИНОБРНАУКИ РОССИИ
САНКТ-ПЕТЕРБУРГСКИЙ ГОСУДАРСТВЕННЫЙ
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КАФЕДРА МО ЭВМ

ОТЧЕТ

по лабораторной работе №2

по дисциплине «Сети и телекоммуникации»

Тема: Настройка таблиц маршрутизации

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Санкт-Петербург

2023

Цель работы.

Изучение методов статической маршрутизации в IP-сетях; овладение управлением таблицами маршрутизации на узлах сетевого уровня.

Задание.

1. Для всех узлов сети установить IP-адреса, маски подсетей и шлюзы по умолчанию, чтобы добиться успешного выполнения Echo-запроса ближайших соседей (находящихся в одной подсети).

2. Настроить таблицы маршрутизации на маршрутизаторах, чтобы добиться доставки пакетов от узла K1 к узлу K2 и обратно, от узла K2 к K3 и обратно, от узла K3 к K1 и обратно. Пакеты должны доходить до узлов кратчайшим путем.

3. Настроить таблицы маршрутизации на узлах K1, K2 и K3, чтобы обеспечить кратчайшую доставку пакетов между этими узлами, если это невозможно было обеспечить в п. 2.

В отчете привести конфигурацию TCP/IP для каждого из узлов, таблицы маршрутизации, результаты Echo-запросов между узлами K1, K2 и K3, а также обоснование правильности и оптимальности выбранных маршрутов.

Выполнение работы.

1. Исходная схема сети представлена на рисунке 1

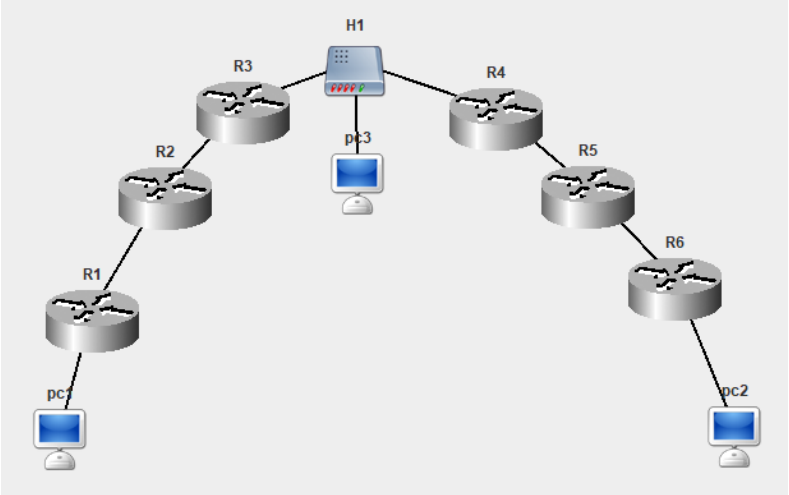

Рисунок 1 схема сети

Установлена следующая конфигурация для компьютеров в сети:

Узел	IP адрес	Маска подсети	Шлюз по умолчанию
PC1	192.168.0.4	255.255.255.252	192.168.0.5
PC2	192.168.0.29	255.255.255.252	192.168.0.28
PC3	192.168.0.17	255.255.255.252	192.168.0.18

Для маршрутизаторов установлена следующая конфигурация:

Узел	IP адрес (eth0)	IP адрес (eth1)	Маска	Шлюз по умолчанию
R1	192.168.0.5	192.168.0.8	255.255.255.252	192.168.0.4
R2	192.168.0.9	192.168.0.12	255.255.255.252	192.168.0.8
R3	192.168.0.13	192.168.0.16	255.255.255.252	192.168.0.12
R4	192.168.0.18	192.168.0.20	255.255.255.252	192.168.0.21
R5	192.168.0.21	192.168.0.24	255.255.255.252	192.168.0.25
R6	192.168.0.25	192.168.0.28	255.255.255.252	192.168.0.29

Так как по условию лабораторной работы все адреса из диапазона 192.168.0.1-192.168.0.254, то была выбрана маска 255.255.255.252. Она позволяет находится в одной сети максимум 4 устройствам (в текущей схеме их максимум 3), а также позволяет задавать 7 подсетей.

Данная конфигурация обеспечивает корректную доставку пакетов внутри подсетей. Для подтверждения были выполнены echo-запросы в каждой из подсетей с узлов PC1, PC2, PC3. Результат echo-запросов представлен на рисунке 2.

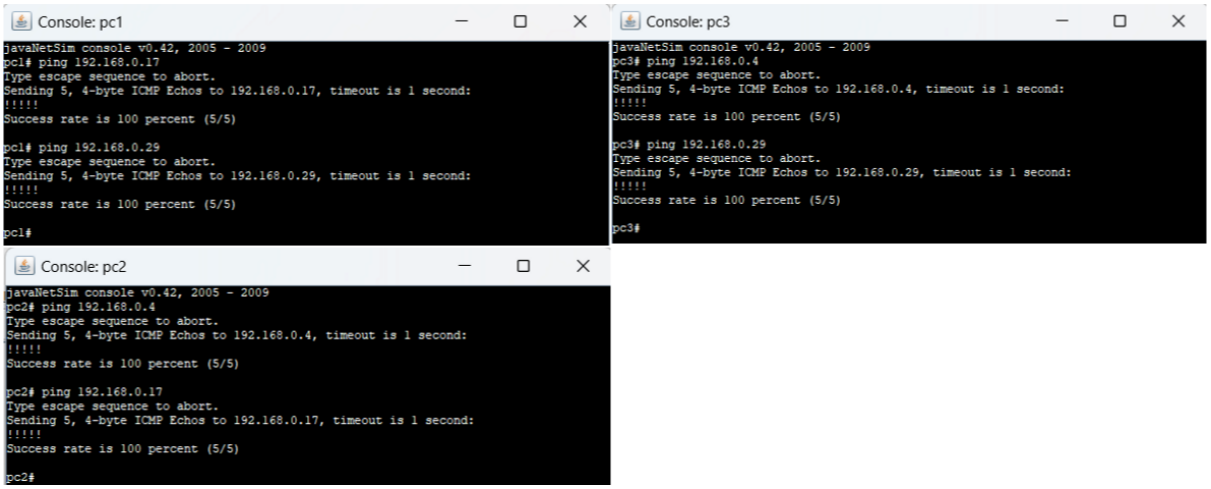

Рисунок 2 результат echo-запросов

2. Для работоспособности сети и достижения минимального пути между устройствами, таблицы маршрутизаций были дополнены статическими записями. Таблицы маршрутизаций представлены на рисунке 3

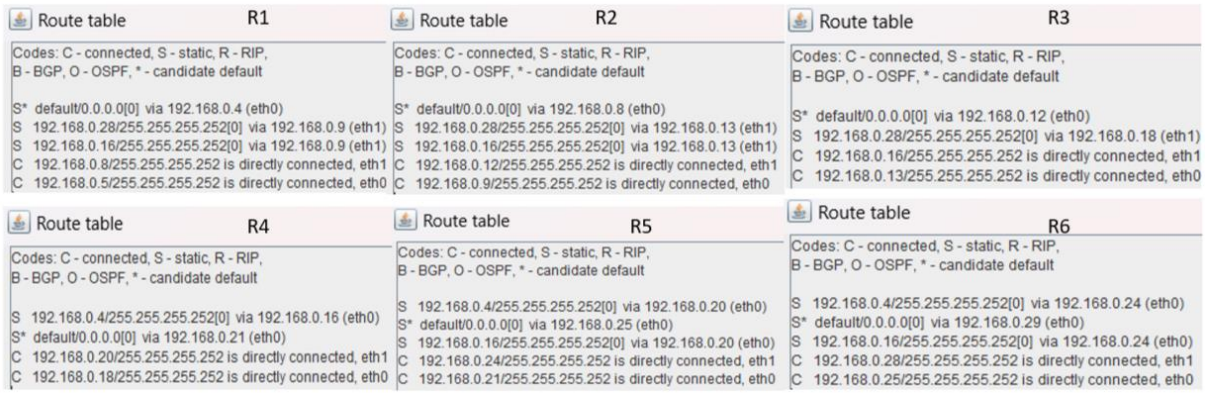

Рисунок 3 таблицы маршрутизаций

Также была добавлена новая запись в таблицу маршрутизаций PC3 с целью добиться кратчайшего расстояния между PC1 и PC3, она представлена на рисунке 3.

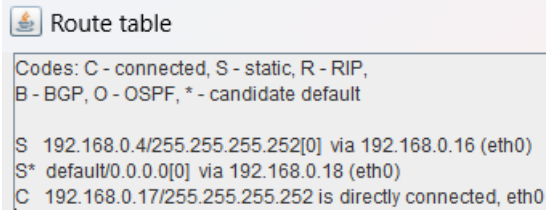

Рисунок 4 таблица маршрутизаций PC3

3. Для проверки работоспособности и отслеживания маршрута были проведены наблюдения следования ICMP пакета между всеми компьютерами: PC1-PC3 – рисунок 5, PC2-PC3 – рисунок 6, PC1-PC2 – Приложение А.

01:33:03-190	pc1	Echo Request Packet	Network	Created Echo Request packet to 192.168.0.17
01:33:03-190	pc1	ICMP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.5).
01:33:03-190	R1	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	R1	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:33:03-190	R1	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.9).
01:33:03-190	R2	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	R2	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:33:03-190	R2	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.13).
01:33:03-190	R3	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	R3	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:33:03-190	R3	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.17).
01:33:03-190	pc3	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	pc3	ICMP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:33:03-190	pc3	Echo Reply Packet	Network	Created Echo Reply packet to 192.168.0.4
01:33:03-190	pc3	ICMP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.16).
01:33:03-190	R3	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	R3	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:33:03-190	R3	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.12).
01:33:03-190	R2	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	R2	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:33:03-190	R2	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.8).
01:33:03-190	R1	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	R1	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:33:03-190	R1	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.4).
01:33:03-190	pc1	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:33:03-190	pc1	ICMP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:33:03-190	pc1	Echo Reply Packet	Network	Echo reply packet received from 192.168.0.17

Рисунок 5 ICMP пакеты между PC1 и PC3

01:34:12-640	pc2	Echo Request Packet	Network	Created Echo Request packet to 192.168.0.17
01:34:12-640	pc2	ICMP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.28).
01:34:12-640	R6	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	R6	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:34:12-640	R6	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.24).
01:34:12-640	R5	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	R5	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:34:12-640	R5	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.20).
01:34:12-640	R4	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	R4	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:34:12-640	R4	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.17).
01:34:12-640	pc3	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	pc3	ICMP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:34:12-640	pc3	Echo Reply Packet	Network	Created Echo Reply packet to 192.168.0.29
01:34:12-640	pc3	ICMP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.18).
01:34:12-640	R4	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	R4	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:34:12-640	R4	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.21).
01:34:12-640	R5	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	R5	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:34:12-640	R5	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.25).
01:34:12-640	R6	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	R6	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:34:12-640	R6	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.29).
01:34:12-640	pc2	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:34:12-640	pc2	ICMP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:34:12-640	pc2	Echo Reply Packet	Network	Echo reply packet received from 192.168.0.17

Рисунок 6 ICMP пакеты между PC1 и PC3

Вывод.

В ходе выполнения работы исследованы методы статической маршрутизации в IP-сетях, выполнена конфигурация сети для успешного

выполнения echo запросов внутри каждой из подсетей, также настроены таблицы маршрутизации в узлах для обеспечения корректной отправки пакетов между компьютерами.

ПРИЛОЖЕНИЕ А

ICMP пакеты при пересылке между PC1 и PC2

01:38:18-818	pc1	Echo Request Packet	Network	Created Echo Request packet to 192.168.0.29
01:38:18-818	pc1	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	R1	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R1	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R1	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.4).
01:38:18-818	pc1	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	pc1	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	pc1	ICMP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.5).
01:38:18-818	R1	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R1	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R1	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	R2	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R2	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R2	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.8).
01:38:18-818	R1	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R1	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R1	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.9).
01:38:18-818	R2	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R2	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R2	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	R3	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R3	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R3	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.12).
01:38:18-818	R2	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R2	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R2	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.13).
01:38:18-818	R3	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R3	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R3	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	R4	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R4	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R4	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.16).
01:38:18-818	R3	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R3	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	pc3	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R3	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.18).
01:38:18-818	R4	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R4	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R4	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	R5	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R5	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R5	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.20).
01:38:18-818	R4	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R4	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R4	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.21).
01:38:18-818	R5	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R5	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R5	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	R6	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R6	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R6	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.24).
01:38:18-818	R5	ARP_packet	Network	ProtocolStack received packet from local Interface.

01:38:18-818	R5	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R5	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.25).
01:38:18-818	R6	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R6	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R6	ARP_packet	Network	Sending broadcast packet from ProtocolStack.
01:38:18-818	pc2	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	pc2	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	pc2	ARP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.28).
01:38:18-818	R6	ARP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R6	ARP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	R6	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.29).
01:38:18-818	pc2	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	pc2	ICMP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	pc2	Echo Reply Packet	Network	Created Echo Reply packet to 192.168.0.4
01:38:18-818	pc2	ICMP_packet	Network	Sending packet from ProtocolStack (to 192.168.0.28).
01:38:18-818	R6	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R6	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R6	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.24).
01:38:18-818	R5	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R5	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R5	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.20).
01:38:18-818	R4	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R4	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R4	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.16).
01:38:18-818	R3	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R3	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R3	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.12).
01:38:18-818	R2	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R2	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R2	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.8).
01:38:18-818	R1	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	R1	ICMP_packet	Network	Packet Received: Network Layer Device is Routable forwarding packet.
01:38:18-818	R1	ICMP_packet	Network	Forwarding packet from ProtocolStack(to 192.168.0.4).
01:38:18-818	pc1	ICMP_packet	Network	ProtocolStack received packet from local Interface.
01:38:18-818	pc1	ICMP_packet	Network	Confirmed Packet is for this Network Layer Device.
01:38:18-818	pc1	Echo Reply Packet	Network	Echo reply packet received from 192.168.0.29