## МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ

## «МОСКОВСКИЙ АВИАЦИОННЫЙ ИНСТИТУТ

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**УТВЕРЖДАЮ** 

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«\_\_\_»\_\_\_\_ 2023 г.

Отчет

По лабораторной работе №2

на тему: «Изучение программы Cisco Packet Tracer»

по дисциплине: «Сети ЭВМ и телекоммуникации»

Выполнил: студент гр. ДВМЗ-74\_\_\_\_\_ Карпенко А.А.

«\_\_\_»\_\_\_\_ 2023 г.

Байконур 2023 г.

Цель работы:

Знакомство с сетевым симулятором Cisco Packet Tracer. Получение базовых навыков работы со средой. Изучение принципов работы концентраторов и коммутаторов.

Задание на выполнение:

Построить простейшую сеть. Исследовать работу сети в заданных режимах.

## 1 Порядок выполнения

Этап 1. Строится простейшую сеть в соответствии с рисунок 1. Снабжается проект сети пометками. Запускается с командной строки утилита PING между любыми двумя узлами (Рисунок 3).





Задаются IP-адреса через окно конфигурации и через средства графического интерфейса. (Рисунок 2а,б)

PC0					
Physical	Config	Desktop	Software/Services		
GLO	BAL	A		FastEthernet	
Algorithm	Settings	Port S	tatus		[
INTER	FACE	Bandw	idth		
FastEt	hernet	10	Mbps	100 Mbps	
		Duplex			<b>V</b>
		🔘 Full	Duplex	Item Half Duplex	E
		MAC A	ddress	0001.436B.A07B	
		⊂ IP Co ⊚ DHC	onfiguration CP		
		Sta	tic		
		IP Add	ress	192.168.0.1	
		Subnet	t Mask	255.255.255.0	
		– IPv6 Link Lo	Configuration cal Address:		
		O DHO	CP		
		Aut	o Config		-
				11	•

Рисунок 2а - Задание IP-адреса через окно конфигурации(Вариант 1)

P Configuration		X pttp:
O DHCP		
Static		
		Web Browse
IP Address	192.168.0.1	
Subnet Mask	255.255.255.0	
Default Gateway		
DNS Server		Cisco IP
		Communicate

Рисунок 2б - Задание IP-адреса через окно конфигурации(Вариант 2) Запускается с командной строки утилита PING между любыми двумя узлами (рис.3).

PC0		
Physical Config Desktop	Software/Services	
Command Prompt		X
Reply from 192.168.0.1: byte	es=32 time=16ms TTL=128	
Reply from 192.168.0.1: byte	es=32 time=15ms TTL=128	
Reply from 192.168.0.1: byte Reply from 193.168.0.1: byte	es=32 time=0ms TTL=128	
Reply 110m 192.168.0.1. Byte	29-32 Cime-10mg 11L-128	
Ping statistics for 192.168.	.0.1:	
Packets: Sent = 4, Recei	ived = 4, Lost = 0 (0% loss),	
Approximate round trip times	s in milli-seconds:	
Minimum = Oms, Maximum =	= 16ms, Average = 11ms	
PC>ping 192.168.0.2		
Pinging 192.168.0.2 with 32	bytes of data:	
Reply from 192.168.0.2: byte	es=32 time=125ms TTL=128	
Reply from 192.168.0.2: byte	es=32 time=62ms TTL=128	
Reply from 192.168.0.2: byte	es=32 time=63ms TTL=128	=
Reply from 192.168.0.2: byte	es=32 time=62ms TTL=128	
Ping statistics for 192 168	0.2:	
Packets: Sent = 4, Recei	ived = 4, Lost = 0 (0% loss),	
Approximate round trip times	in milli-seconds:	
Minimum = 62ms, Maximum	= 125ms, Average = 78ms	
PC>		-

Рисунок 3 - Запуск с командной строки утилиты PING

В режиме симуляции настраивается фильтр, прослеживается продвижение пакетов ICMP (Рисунок 4), просматривается дополнительная информация и структура пакета (Рисунок 5).



Рисунок 4 – Список событий



Рисунок 5 – Дополнительная информация и структура пакета

Этап 2. Добавляются в сеть дополнительные элементы в соответствии с рисунком 6.

Ne Edit Options View Tools Extensions Help	15	New Cluster Nove Object. Set Tiled Background
		New Cruster Nove Object. Set Tiled Beckground
		,
140 141 304 51 255 255 35 0 100	And Green The Green The Green Control of Con	
	98.286.27 296.255.286.0	
190 190,186.8.2 255.255.255.0 90;197 190;196 190;197 190;197 190;196 1		
102.164.5.3 102 203.205.205.0	1982 64 1952 948 65 1952 1982 95 6 2952 35 6 2952 55 6 2552 55 6	
d		

Рисунок 6 – Сеть с дополнительными элементами

В терминале просматривается адресная таблица коммутатора с помощью команды show mac (рис.7).

Switch0					×
Physical C	onfig CLI				
		IOS Com	mand Line Interface		
o up					~
%LINK-5-CHAN	NGED: Interfa	ce FastEther	net0/3, changed state to	up	
%LINEPROTO-! o up	5-UPDOWN: Lir	e protocol o	n Interface FastEthernet	0/3, changed state t	
%LINK-5-CHAN	NGED: Interfa	ce FastEther	net0/24, changed state t	o up	
%LINEPROTO-	5-UPDOWN: Lir	e protocol o	n Interface FastEthernet	0/24, changed state	
Switch>show Ma	mac ac Address Ta	ble			III
Vlan Mac	Address	Туре	Ports		
Switch>show Ma	mac ac Address Ta	ble			
L				Copy Pas	₹te

Рисунок 7 – Терминал с адресной таблицей коммутатора

Терминал пуст так как с узлов подключенных к коммутатору не проводилась серия запусков утилиты ping до других узлов сети. На рисунке 8 представлена итоговая адресная таблица.

nyaicai	Config CLI				
		IOS Com	mand Line Inte	rface	
VIAN	Mac Address	туре	POILS		
					-
1	0001.436b.a07b	DYNAMIC	Fa0/24		
1	0001.9685.1d84	DYNAMIC	Fa0/24		
1	0006.2a78.0b46	DYNAMIC	Fa0/2		
1	0007.ec87.5eda	DYNAMIC	Fa0/24		
1	0030.a32a.c506	DYNAMIC	Fa0/24		
1	0050.0£40.5302	DYNAMIC	Fa0/3		
Switch:	≻show mac Mac Address Ta	ble			
Switch: 	≻show mac Mac Address Ta  Mac Address	ble 	Ports		
Switch:  Vlan 	>show mac Mac Address Ta Mac Address 	ble  Type 	Ports		
Switch Vlan  1	>show mac Mac Address Ta Mac Address Mac Address 0001.436b.a07b	ble Type  DYNAMIC	Ports  Fa0/24		
Switch:  Vlan  1 1	<pre>&gt;show mac Mac Address Ta Mac Address Mac Address 0001.436b.a07b 0001.9685.1d84</pre>	ble Type  DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/24		
Switch:  Vlan  1 1 1 1	<pre>&gt;show mac Mac Address Ta </pre>	ble Type DYNAMIC DYNAMIC DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/24 Fa0/2		
Switch  Vlan  1 1 1 1 1	<pre>&gt;show mac Mac Address Ta Mac Address  0001.436b.a07b 0001.9685.1d84 0006.2a78.0b46 0007.ec87.5eda</pre>	ble Type DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/2 Fa0/2 Fa0/24		
Switch  Vlan  1 1 1 1 1 1	<pre>&gt;show mac Mac Address Ta Mac Address  0001.436b.a07b 0001.9685.1d84 0006.2a78.0b46 0007.ec87.5eda 000d.bd7c.5740</pre>	DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/24 Fa0/2 Fa0/24 Fa0/1		
Switch:  Vlan  1 1 1 1 1 1 1	<pre>&gt;show mac Mac Address Ta Mac Address 0001.436b.a07b 0001.9685.1d84 0006.2a78.0b46 0007.ec87.5eda 000d.bd7c.5740 0030.a32a.c506</pre>	DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/24 Fa0/2 Fa0/24 Fa0/1 Fa0/24		
Switch:  Vlan  1 1 1 1 1 1 1 1 1	<pre>&gt;show mac Mac Address Ta </pre>	DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/24 Fa0/2 Fa0/24 Fa0/1 Fa0/24 Fa0/3		
Switch:  Vlan 1 1 1 1 1 1 2 Switch:	<pre>&gt;show mac Mac Address Ta </pre>	DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC DYNAMIC	Ports  Fa0/24 Fa0/24 Fa0/24 Fa0/24 Fa0/1 Fa0/24 Fa0/3		E

Рисунок 8 – Адресная таблица коммутатора

С помощью адресной таблицы и значений mac адресов определяются какие устройства присоединены к тому или иному входу/выходу коммутатора. Список устройств представлен в Таблице 1.

Таблица	1 -	- П	одключенные	VCT	ройства
1.00011140	-			J	p • • • • • • • • • •

N⁰	Вход/Выход коммутатора	№ ПК (Устройства)	МАС адрес устройства
1	Fa0/24	ПКО	0001.436B.A07B
2	Fa0/24	ПК1	0001.9685.1D84
3	Fa0/24	ПК2	0030.A32A.C506
4	Fa0/24	ПК3	0007.EC87.5EDA
5	Fa0/1	ПК4	000D.BD7C.5740
6	Fa0/2	ПК5	0006.2A78.0B46
7	Fa0/3	Laptop0	0050.0F40.5302

Проще всего определяются устройства с входами Fa0/1, Fa0/2, Fa0/3, т.к это первые три входа коммутатора, исходя из этого определяется, что входу Fa0/1 соответствует ПК4, Fa0/2 – ПК5 и Fa0/3 – Laptop0, потому что они были подключены по порядку. Вход же Fa0/24 имеет несколько значений, это обусловлено тем что к нему был подключен отдельный концентратор, к которому в свою очередь подключены еще 4 устройства.

Этап 3. Добавляются в сеть дополнительные элементы в соответствии с рисунком 9.



Рисунок 9 – Сеть с дополнительным элементом

Проводится переход в режим реального времени и на 2-3 узлах подключенных к концентраторам имитируется загрузка сети с помощью генератора трафика (Рисунок 10).

ysical Config Deskt	op Software/Serv	ices		
Traffic Generator         Source Settings         Source Device: PC0         Outgoing Port:         FastEthernet         PDU Settings         Select Application:         Destination IP Address:         Source IP Address:         TTL:         TOS:         Sequence Number:         Size:	▼       Auto Select Port         192.168.0.11	PING V	run nmand ompt Jrowser	Web Browser Web Browser Cisco IP Communicator
Simulation Settings Single Shot Periodic Interval: 0.001		Seconds		

Рисунок 10 – Генератор трафика

Параллельно на одном из узлов запускается утилита ping –n 200 192.168.0.Х, определяется количество потерянных пакетов (Рисунок 11).

Physical Config Desktop Software/Services         Command Prompt       X         Packet Tracer PC Command Line 1.0       PC>ping -n 200 192.168.0.5         Pinging 192.168.0.5 with 32 bytes of data:       Image: Command Co	PC8	
Command Prompt       X         Packet Tracer PC Command Line 1.0       PC>ping -n 200 192.168.0.5         Pinging 192.168.0.5 with 32 bytes of data:         Request timed out.         Reply from 192.168.0.5: bytes=32 time=94ms TTL=128         Request timed out.         Reply from 192.168.0.5: bytes=32 time=18ms TTL=128         Request timed out.         Reply from 192.168.0.5: bytes=32 time=32ms TTL=128         Request timed out.         Reply from 192.168.0.5: bytes=32 time=36ms TTL=128         Request timed out.	Physical Config Desktop	Software/Services
Command Prompt       X         Packet Tracer PC Command Line 1.0       PC>ping -n 200 192.168.0.5         Pinging 192.168.0.5 with 32 bytes of data:       Image: Command Line 1.0         Request timed out.       Request timed out.         Request timed out.       Request timed out.         Reply from 192.168.0.5: bytes=32 time=94ms TTL=128         Request timed out.         Reply from 192.168.0.5: bytes=32 time=18ms TTL=128         Request timed out.         Reply from 192.168.0.5: bytes=32 time=32ms TTL=128         Request timed out.         Reply from 192.168.0.5: bytes=32 time=36ms TTL=128         Request timed out.		
<pre>Packet Tracer PC Command Line 1.0 PC&gt;ping -n 200 192.168.0.5 Pinging 192.168.0.5 with 32 bytes of data: Request timed out. Request timed out. Request timed out. Reply from 192.168.0.5: bytes=32 time=94ms TTL=128 Reply from 192.168.0.5: bytes=32 time=18ms TTL=128 Reply from 192.168.0.5: bytes=32 time=18ms TTL=128 Reply from 192.168.0.5: bytes=32 time=18ms TTL=128 Reply from 192.168.0.5: bytes=32 time=32ms TTL=128 Reply from 192.168.0.5: bytes=32 time=32ms TTL=128 Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Request timed out. Reply from 192.168.0.5: bytes=32 time=36ms TTL=128 Re</pre>	Command Promot	
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REPTY TOOM TYZ. TOO. 0.5. DYCES 32 CIME SOMS TIL-128	Reply from 192.188.0.5: Byt	
E Mail PPPoF Dialer Text Editor	E Mail PPPoF F	Dialer Text Editor

R PC8	
Physical Config Desktop Software/Services	
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Request timed out.	
Reply from 192.168.0.5: bytes=32 time=36ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=129ms TTL=128	
Request timed out.	
Reply from 192.168.0.5: bytes=32 time=140ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=196ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=36ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=33ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=37ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=253ms TTL=128	
Request timed out.	
Reply from 192.168.0.5: bytes=32 time=159ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=113ms TTL=128	
Reply from 192.168.0.5: bytes=32 time=20ms TTL=128	
Request timed out.	
Ping statistics for 192.168.0.5:	
Packets: Sent = 200, Received = 115, Lost = 85 (43% loss),	
Approximate round trip times in milli-seconds:	
Minimum = 3ms, Maximum = 470ms, Average = 109ms	
PC> ~	
F Mail PPPoF Dialer Text Editor	

Рисунок 11 - Количество потерянных пакетов

Концентраторы заменяются коммутаторами (Рисунок 12) и снова определяется количество потерянных пакетов (Рисунок 13).



Рисунок 12 – Замена концентраторов на коммутаторы

PC8		- 0 ×
Physical Config Desktop	Software/Services	
Command Prompt		X
Reply from 192.168.0.5: bytes	s=32 time=53ms TTL=128	<b>^</b>
Reply from 192.168.0.5: bytes	s=32 time=93ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=51ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=41ms IIL=128	
Reply from 192.168.0.5: bytes	=32 time=94mg TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=47ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=62ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=47ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=78ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=109ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=47ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=62ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=78ms TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=4/ms IIL=128	
Reply from 192 168 0 5: bytes	=32 time=93mg TTL=128	
Reply from 192.168.0.5: bytes	s=32 time=69ms TTL=128	
Ping statistics for 192.168.0	0.5:	
Packets: Sent = 200, Rece	eived = 200, Lost = 0 (0% loss),	
Approximate round trip times	in milli-seconds:	
Minimum = 10ms, Maximum =	= 203ms, Average = 59ms	
DON		
207		Ť

Рисунок 13 - Количество потерянных пакетов

Исходя из полученной информации о потере пакетов, делается вывод о том, что концентраторы теряют гораздо больше пакетов в отличии от коммутаторов, которые не теряют их вообще. Это обусловлено тем, что концентратор — это центральная точка подключения устройств в локальной сети (LAN). Однако в сети на основе концентратора действует ограничение на пропускную способность для пользователей. Чем больше устройств подключается к сетевому концентратору, тем медленнее данные будут достигать места назначения. У коммутаторов нет ограничений, которые характерны для сетевых концентраторов, или каких-либо других ограничений.

## Вывод

В ходе выполнения лабораторной работы приобретены навыки работы с сетевым симулятором Cisco Packet Tracer. Получены базовые навыки работы со средой. Изучены принципы работы концентратора и коммутатора.