

Модуль 4

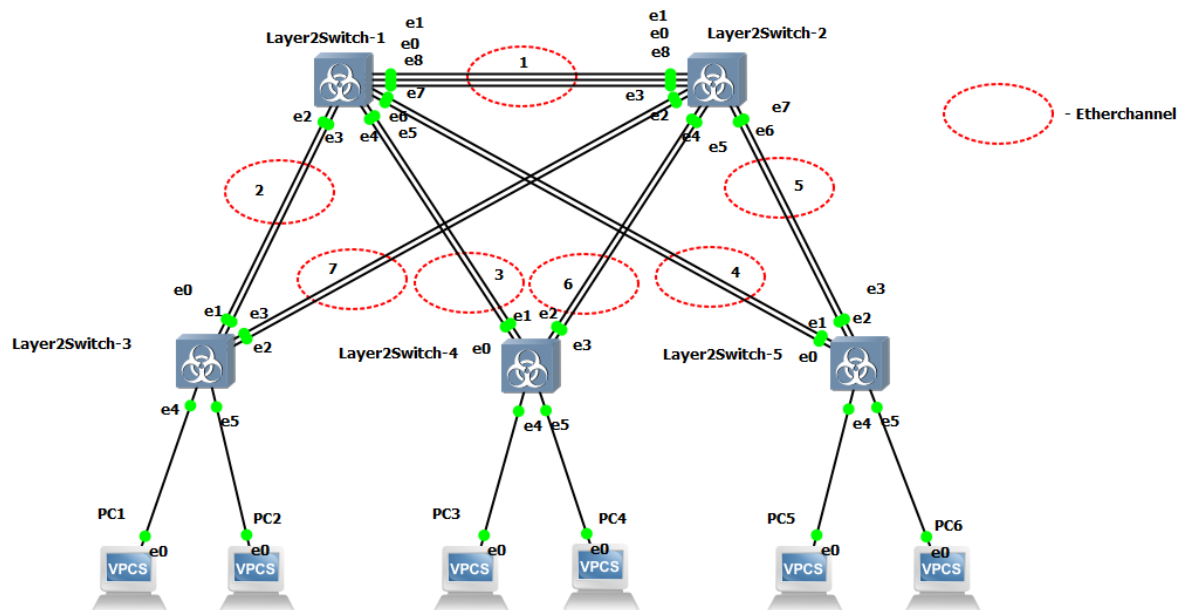
Лабораторная работа №3

Тема: Настройка агрегирования каналов

Задания:

- 1) Для заданной на схеме `schema-lab3` сети, состоящей из управляемых коммутаторов и персональных компьютеров настроить на коммутаторах протокол LACP агрегирования каналов технологии EtherChannel
- 2) Изменяя режим работы групп портов в режиме агрегирования произвольных соседних коммутаторов проверить работоспособность режима агрегации
- 3) Получить статистику пакетов для портов коммутаторов, результаты сохранить в файл, создать некоторый трафик между различными персональными компьютерами, сохранить новую статистику (рекомендуется использовать таблицы excel или его opensource аналоги для наглядности)
- 4) Сохранить файлы конфигураций устройств в виде набора файлов с именами, соответствующими именам устройств
- 5*) Опциональное задание: Повторить пункты 1-4 используя протокол PAgP

1) Для этой сети я настроил агрегирование каналов:



```

Layer2Switch-1 - PuTTY
U - in use      f - failed to allocate aggregator
M - not in use, minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

Number of channel-groups in use: 4
Number of aggregators: 4

Group Port-channel Protocol Ports
-----
1 Po1(SD) LACP Gi0/0(P) Gi0/1(P) Gi2/0(P)
2 Po2(SD) LACP Gi0/2(P) Gi0/3(P)
3 Po3(SD) LACP Gi1/0(P) Gi1/1(P)
4 Po4(SD) LACP Gi1/2(P) Gi1/3(P)

VPCS-12-01#

```

```

Layer2Switch-2 - PuTTY
U - in use      f - failed to allocate aggregator
M - not in use, minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

Number of channel-groups in use: 4
Number of aggregators: 4

Group Port-channel Protocol Ports
-----
1 Po1(SD) LACP Gi0/0(P) Gi0/1(P) Gi2/0(P)
2 Po2(SD) LACP Gi1/2(P) Gi1/3(P)
3 Po3(SD) LACP Gi1/0(P) Gi1/1(P)
4 Po4(SD) LACP Gi0/2(P) Gi0/3(P)

VPCS-12-01#

```

```

Layer2Switch-3 - PuTTY
U - in use      f - failed to allocate aggregator
M - not in use, minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

Number of channel-groups in use: 3
Number of aggregators: 3

Group Port-channel Protocol Ports
-----
1 Po1(SD) LACP Gi0/0(P) Gi0/1(P)
2 Po2(SD) LACP Gi0/2(P) Gi0/3(P)
3 Po3(SD) LACP Gi1/0(P) Gi1/1(P)

VPCS-12-01#

```

```

Layer2Switch-4 - PuTTY
U - in use      f - failed to allocate aggregator
M - not in use, minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

Number of channel-groups in use: 2
Number of aggregators: 2

Group Port-channel Protocol Ports
-----
1 Po3(SD) LACP Gi0/0(P) Gi0/1(P)
2 Po4(SD) LACP Gi0/2(P) Gi0/3(P)

VPCS-12-01#

```

```

Layer2Switch-5 - PuTTY
U - in use      f - failed to allocate aggregator
M - not in use, minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

Number of channel-groups in use: 2
Number of aggregators: 2

Group Port-channel Protocol Ports
-----
1 Po3(SD) LACP Gi0/0(P) Gi0/1(P)
2 Po4(SD) LACP Gi0/2(P) Gi0/3(P)

VPCS-12-01#

```

Сверху слева направо свичи 1 и 2, снизу слева направо 3 4 5 соответственно.

Активные порты я сделал у верхних роутеров, нижние – пассивные.

2) Изменяю на 1 свиче 2 группу с active на passive. Т.к. это корневые порты по str:

```
Layer2Switch-3 - PuTTY

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0cb8.ab9d.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 15 sec

Interface Role Sts Cost Prio.Nbr Type
-----
Gi1/0 Desg FWD 4 128.5 Shr
Gi1/1 Desg FWD 4 128.6 Shr
Po2 Root FWD 4 128.66 Shr
Po7 Altn BLK 3 128.67 Shr
```

Результат:

```
Layer2Switch-1 - PuTTY

Port 68 (Port-channel4)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0cdc.e835.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 15 sec

Interface Role Sts Cost Prio.Nbr Type
-----
Po1 Desg FWD 4 128.65 Shr
Po3 Desg FWD 3 128.67 Shr
Po4 Root FWD 3 128.68 Shr

vIOS-L2-01#
*Jun 11 08:18:02.713: %EC-5-CANNOT_BUNDLE2: Gi0/3 is not compatible with Gi0/2 and
/2 is active - Gi0/3 is bundle

Layer2Switch-3 - PuTTY

Root ID Priority 32769
Address 0c1b.cccb.0000
Cost 10
Port 67 (Port-channel7)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

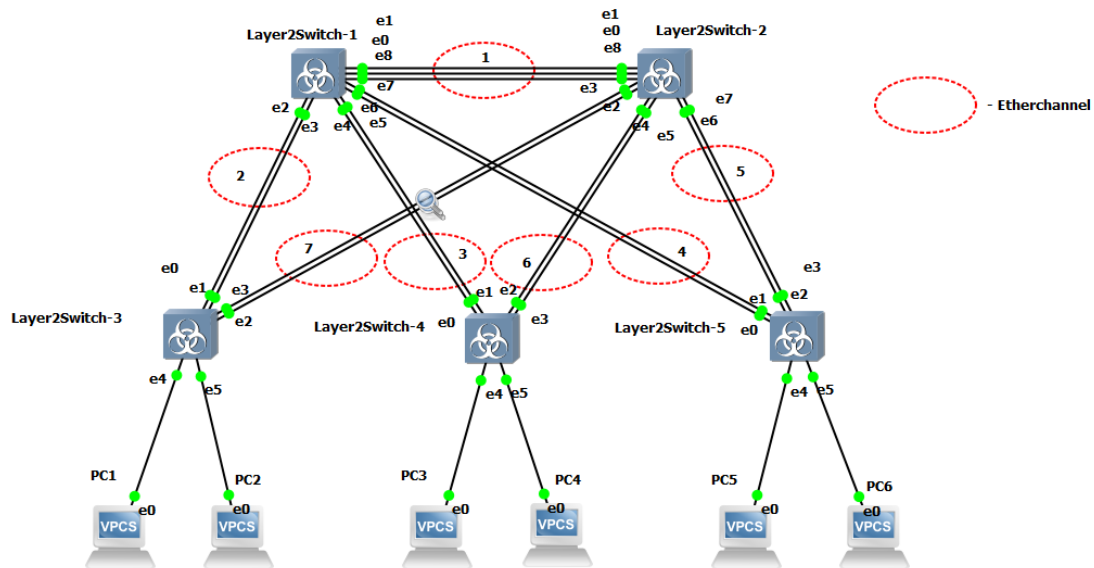
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0cb8.ab9d.0000
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 15 sec

Interface Role Sts Cost Prio.Nbr Type
-----
Gi1/0 Desg FWD 4 128.5 Shr
Gi1/1 Desg FWD 4 128.6 Shr
Po2 Desg FWD 4 128.66 Shr
Po7 Root LIS 3 128.67 Shr

--More--
```

Видно, что 1 свич перестал быть корневым, у третьего свича RP изменился со второго агрегированного порта на 7.

3) Анализирую трафик на 7 канале и 5:



Видно, что очень много служебного трафика STP, LOOP, и LACP

Заявка из - [Layer2Switch-3 Ethernet2 to Layer2Switch-2 Ethernet2]

Файл Редактирование Просмотр Запуск Заверш Анализ Статистика Телефония Беспроводной Инструменты Помощь

Принимать радиопроводный фидер <--> +

No.	Time	Source	Destination	Protocol	Length	Info			
164	142.735488	0c:b8:ab:9d:00:02	0c:b8:ab:9d:00:02	LOOP	60	Reply			
165	143.620952	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
166	145.625808	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
167	147.625912	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
168	148.461564	0c:87:be:91:00:02	0c:87:be:91:00:02	LOOP	60	Reply			
169	149.625272	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
170	151.625432	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
171	152.625600	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
172	152.733974	0c:b8:ab:9d:00:02	0c:b8:ab:9d:00:02	LOOP	60	Reply			
173	152.748808	0c:b8:ab:9d:00:02	0c:b8:ab:9d:00:02	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
174	153.628362	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
175	155.660903	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
176	155.628805	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
177	157.628813	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
178	157.625398	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
179	158.485049	0c:87:be:91:00:02	0c:87:be:91:00:02	LOOP	60	Reply			
180	159.624498	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
181	161.624462	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			
182	162.627009	0c:b8:ab:9d:00:02	0c:b8:ab:9d:00:02	Slow-Protocols	120	v1 ACTOR 0c:b8:ab:9d:00:00 P: 3 K: 7 **DCS** PARTNER			
183	162.732463	0c:b8:ab:9d:00:02	0c:b8:ab:9d:00:02	LOOP	60	Reply			
184	163.625272	0c:87:be:91:00:03	0c:87:be:91:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 7 Port			

Всего логов и запросов на загрузку: 184 (100.0%) Пробные: Default

Заявка из - [Layer2Switch-2 Ethernet5 to Layer2Switch-5 Ethernet1]

Файл Редактирование Просмотр Запуск Заверш Анализ Статистика Телефония Беспроводной Инструменты Помощь

Принимать радиопроводный фидер <--> +

No.	Time	Source	Destination	Protocol	Length	Info			
148	119.174823	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
149	119.174908	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
150	119.174968	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
151	120.626372	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
152	122.626387	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
153	122.626387	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
154	123.139573	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
155	123.139622	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
156	123.139647	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
157	123.139733	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
158	123.174815	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
159	123.174918	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
160	122.627278	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
161	123.627973	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
162	125.148139	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
163	123.148188	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			
164	123.148428	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:1b:cc:cb:00:00 Cost = 0 Port			
165	123.173762	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
166	123.173764	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
167	123.173765	0c:87:be:91:00:07	0c:87:be:91:00:07	Spanning-tree (for-...	60	Conf. Root = 32768/200/0c:87:be:91:00:00 Cost = 0 Port			
168	123.922554	0c:1b:cc:cb:00:02	0c:1b:cc:cb:00:02	LOOP	60	Reply			
169	124.626388	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Spanning-tree (for-...	60	Conf. Root = 32768/1/0c:1b:cc:cb:00:00 Cost = 0 Port			

Всего логов и запросов на загрузку: 169 (100.0%) Пробные: Default

Заявка из - [Layer2Switch-3 Ethernet3 to Layer2Switch-2 Ethernet1]

Файл Редактирование Просмотр Запуск Заверш Анализ Статистика Телефония Беспроводной Инструменты Помощь

Принимать радиопроводный фидер <--> +

No.	Time	Source	Destination	Protocol	Length	Info			
74	126.136855	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
75	126.236706	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
76	126.385521	0c:87:be:91:00:03	0c:87:be:91:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
77	126.385643	0c:87:be:91:00:03	0c:87:be:91:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
78	129.597130	0c:87:be:91:00:03	0c:87:be:91:00:03	LOOP	60	Reply			
79	134.248829	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	LOOP	60	Reply			
80	139.595921	0c:87:be:91:00:03	0c:87:be:91:00:03	LOOP	60	Reply			
81	140.514537	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	LOOP	413	Device ID: v105-L2-01 Port ID: GigabitEthernet1/3			
82	144.248039	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	LOOP	60	Reply			
83	144.471268	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	Slow-Protocols	120	v1 ACTOR 0c:b8:ab:9d:00:00 P: 4 K: 7 **DCS** PARTNER			
84	146.653509	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
85	147.329307	0c:87:be:91:00:03	0c:87:be:91:00:03	Slow-Protocols	120	v1 ACTOR 0c:87:be:91:00:00 P: 4 K: 7 **DCS** PARTNER			
86	149.444879	0c:87:be:91:00:03	0c:87:be:91:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
87	149.594100	0c:87:be:91:00:03	0c:87:be:91:00:03	LOOP	60	Reply			
88	154.246513	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	LOOP	60	Reply			
89	156.134807	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
90	156.134815	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
91	156.362959	0c:87:be:91:00:03	0c:87:be:91:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
92	156.362965	0c:87:be:91:00:03	0c:87:be:91:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
93	159.597594	0c:87:be:91:00:03	0c:87:be:91:00:03	LOOP	60	Reply			
94	164.245010	0c:b8:ab:9d:00:03	0c:b8:ab:9d:00:03	LOOP	60	Reply			

Всего логов и запросов на загрузку: 94 (100.0%) Пробные: Default

Заявка из - [Layer2Switch-2 Ethernet5 to Layer2Switch-5 Ethernet1]

Файл Редактирование Просмотр Запуск Заверш Анализ Статистика Телефония Беспроводной Инструменты Помощь

Принимать радиопроводный фидер <--> +

No.	Time	Source	Destination	Protocol	Length	Info			
45	76.336842	0c:87:be:91:00:07	0c:87:be:91:00:07	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
47	78.455789	0c:87:be:91:00:07	0c:87:be:91:00:07	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
48	80.404775	0c:87:be:91:00:07	0c:87:be:91:00:07	LOOP	60	Reply			
49	82.625944	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
50	82.642753	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
51	86.128590	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	LOOP	60	Reply			
52	90.302355	0c:87:be:91:00:07	0c:87:be:91:00:07	LOOP	60	Reply			
53	96.127195	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	LOOP	60	Reply			
54	99.372648	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Slow-Protocols	120	v1 ACTOR 0c:1b:cc:cb:00:00 P: 4 K: 5 **DCS** PARTNER			
55	100.001777	0c:87:be:91:00:07	0c:87:be:91:00:07	LOOP	60	Reply			
56	100.600752	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Slow-Protocols	120	v1 ACTOR 0c:1b:cc:cb:00:00 P: 200 K: 5 **DCS** PARTNER			
57	106.125363	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	LOOP	60	Reply			
58	106.135782	0c:87:be:91:00:07	0c:87:be:91:00:07	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
59	106.931448	0c:87:be:91:00:07	0c:87:be:91:00:07	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
60	108.404839	0c:87:be:91:00:07	0c:87:be:91:00:07	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
61	110.000241	0c:87:be:91:00:07	0c:87:be:91:00:07	LOOP	60	Reply			
62	112.634443	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Dynamic Trunk Protocol	90	Dynamic Trunk Protocol			
63	112.634444	0c:1b:cc:cb:00:03	0c:1b:cc:cb:00:03	Dynamic Trunk	90	Dynamic Trunk Protocol			

Всего логов и запросов на загрузку: 63 (100.0%) Пробные: Default

The top screenshot shows a Wireshark capture of ICMP traffic on the interface [Layer2Switch-1 Ethernet7 to Layer2Switch-5 Ethernet1]. The packet list displays 14 packets, all of which are Echo (ping) requests and replies between source IP 192.168.0.6 and destination IP 192.168.0.5. The packet details for packet 37 show the Ethernet II header, Internet Protocol Version 4 header, and Internet Control Message Protocol header. The hex data view shows the raw bytes of the packet.

The bottom screenshot shows a Wireshark capture of ICMP traffic on the interface [Layer2Switch-1 Ethernet6 to Layer2Switch-5 Ethernet0]. The packet list displays 14 packets, all of which are Echo (ping) requests and replies between source IP 192.168.0.7 and destination IP 192.168.0.5. The packet details for packet 39 show the Ethernet II header, Internet Protocol Version 4 header, and Internet Control Message Protocol header. The hex data view shows the raw bytes of the packet.

Трафик с одного компьютера идет по своей линии у агрегированного порта, с другого ПК по своей линии.

4) Файлы расположены в папке 3Lab4Mod на гитхабе.