

МДК.01.01

**Организация, принципы
построения и функционирования
компьютерных сетей
3-курс**

Практические занятия

Занятие 03



Logical [Root]

New Cluster Move Object Set Tiled Background Viewport

Организация отказоустойчивой сети.

Для этого используются резервные соединения (традиционная

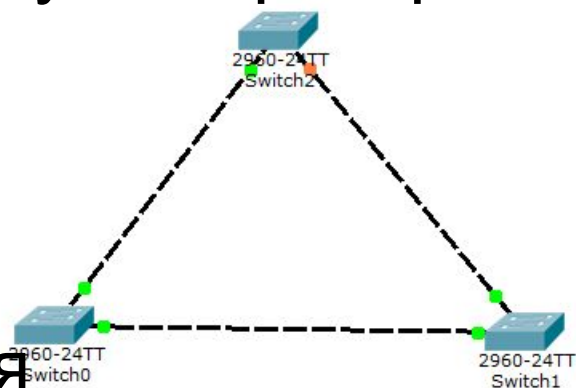
избыточная

топология,

«коммутационная

петля»). Протокол STP решает эти проблемы (RSTP, MSTP).

Выбирается корневой коммутатор.



Time: 69:12:17 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

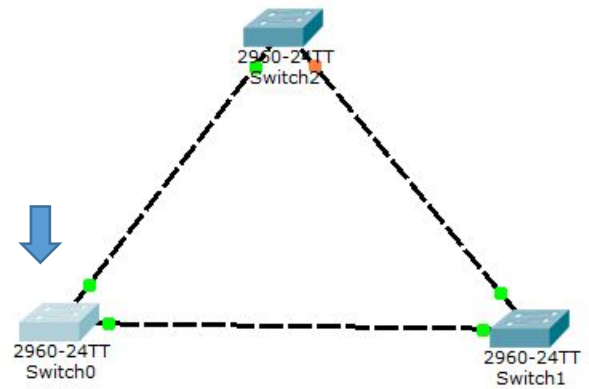
New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





Switch0

Physical Config CLI

IOS Command Line Interface

```

* 1 26 WS-C2960-24TT 12.2 C2960-LANBASE-M

Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEAS
E SOFTWARE (fc1)
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

Press RETURN to get started!

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state t
o up
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state t
o up

Switch>en
Switch#sh
Switch#show s
Switch#show spa
Switch#show spanning-tree
  
```

Copy Paste

Connections

Automatically Choose Connection Type

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete



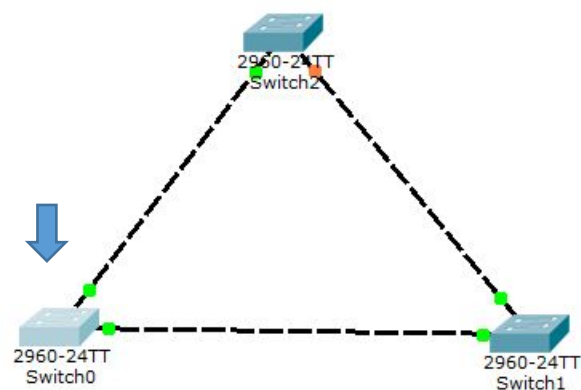
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#sh
Switch#show s
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0003.E488.35B1
            This bridge is the root
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0003.E488.35B1
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

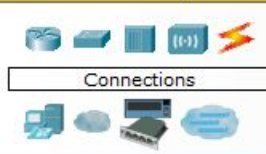
Interface   Role Sts Cost      Prio.Nbr Type
-----
Fa0/2       Desg FWD 19        128.2   P2p
Fa0/1       Desg FWD 19        128.1   P2p
Switch#
          
```

Copy Paste

Данный коммутатор является
корневым (с наименьшим MAC-адресом).

Time: 69:20:33 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete

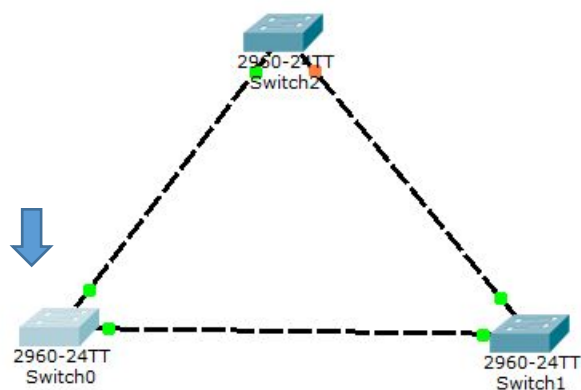




Logical

[Root]

New Cluster Move Object Set Tiled Background Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#sh
Switch#show s
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0003.E488.35B1
            This bridge is the root
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0003.E488.35B1
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/2        Desg FWD 19        128.2   P2p
Fa0/1        Desg FWD 19        128.1   P2p
  
```

Copy Paste

Все его порты находятся
в режиме передачи и являются назначенными.

Time: 69:24:43 Power Cycle Devices Fast Forward Time

Realtime



Connections



Automatically Choose Connection Type

Scenario 0

New Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





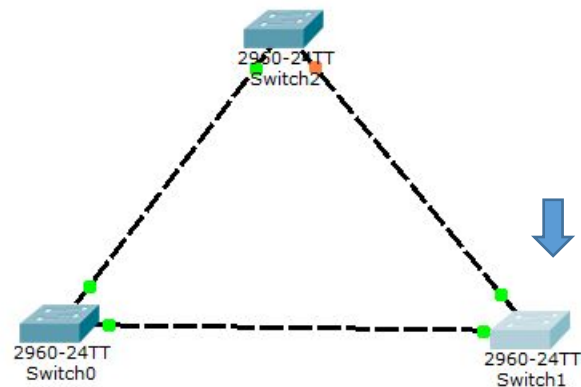
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#spa
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0003.E488.35B1
            Cost      19
            Port      2 (FastEthernet0/2)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0004.9AB2.737D
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface    Role  Sts  Cost    Prio.Nbr  Type
-----
Fa0/2        Root  FWD  19      128.2    P2p
Fa0/1        Desg  FWD  19      128.1    P2p
Switch#
          
```

Copy Paste

Порт Fa0/2 являются корневым портом.

Time: 69:33:05 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete

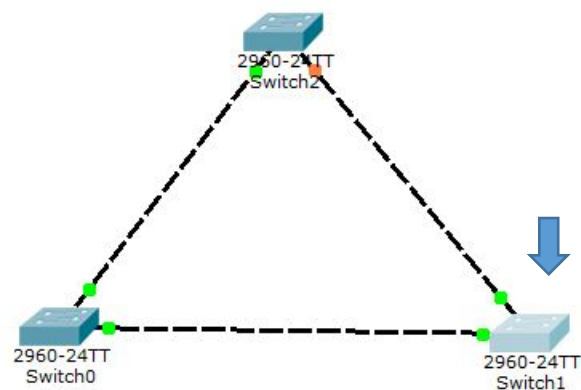




Logical

[Root]

New Cluster Move Object Set Tiled Background Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#spa
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0003.E488.35B1
            Cost      19
            Port      2 (FastEthernet0/2)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0004.9AB2.737D
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

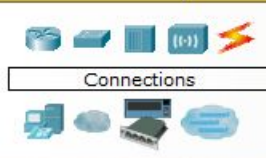
Interface    Role  Sts  Cost    Prio.Nbr  Type
-----
Fa0/2        Root  FWD  19      128.2    P2p
Fa0/1        Desg  FWD  19      128.1    P2p
Switch#
          
```

Copy Paste

Порт Fa0/1 являются назначенным портом.

Time: 69:36:11 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





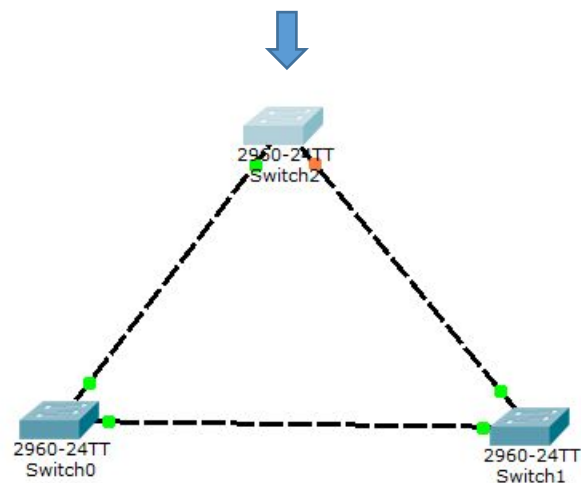
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch2

Physical Config CLI

IOS Command Line Interface

```

o up

Switch>en
Switch#sh
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0003.E488.35B1
            Cost      19
            Port      1(FastEthernet0/1)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0060.5C60.0299
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

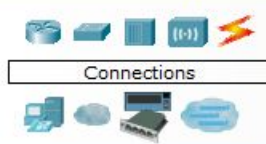
Interface    Role Sts Cost    Prio.Nbr Type
-----
Fa0/2       Altn BLK 19      128.2   P2p
Fa0/1       Root FWD 19      128.1   P2p
Switch#
          
```

Copy Paste

Порт Fa0/1 являются корневым портом.

Time: 69:39:20 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete

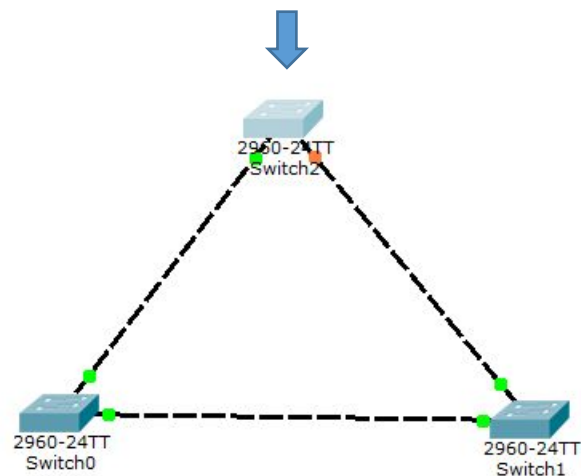




Logical

[Root]

New Cluster Move Object Set Tiled Background Viewport



Switch2

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address     0003.E488.35B1
            Cost       19
            Port       1(FastEthernet0/1)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address     0060.5C60.0299
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface    Role Sts Cost    Prio.Nbr Type
-----
Fa0/2        Altn BLK 19      128.2   P2p
Fa0/1        Root FWD 19      128.1   P2p
Switch#

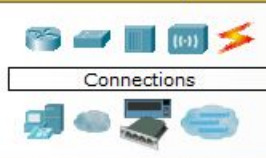
```

Copy Paste

Порт Fa0/2 являются заблокированным (резервным) портом.

Time: 69:40:47 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

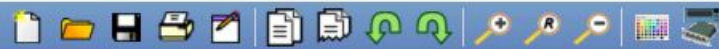
Scenario 0

New Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical [Root] Switch2 Switch1 Switch0

Physical Config CLI Physical Config CLI Physical Config CLI

IOS Command Line Interface IOS Command Line Interface IOS Command Line Interface

```

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
Spanning tree enabled protocol ieee
Root ID    Priority    32769
Address    0003.E488.35B1
Cost       19
Port       1(FastEthernet0/1)
Hello Time 2 sec Max Age 20 sec Forward Del
Bridge ID  Priority    32769 (priority 32768 sys-id-ext
Address    0060.5C60.0299
Hello Time 2 sec Max Age 20 sec Forward Del
Aging Time 20

Interface    Role Sts Cost    Prio.Nbr Type
-----
Fa0/2        Altn BLK 19      128.2   P2p
Fa0/1        Root FWD 19      128.1   P2p
Switch#

```

```

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
Spanning tree enabled protocol ieee
Root ID    Priority    32769
Address    0003.E488.35B1
Cost       19
Port       2(FastEthernet0/2)
Hello Time 2 sec Max Age 20 sec Forward Del
Bridge ID  Priority    32769 (priority 32768 sys-id-ext
Address    0004.9AB2.737D
Hello Time 2 sec Max Age 20 sec Forward Del
Aging Time 20

Interface    Role Sts Cost    Prio.Nbr Type
-----
Fa0/2        Root FWD 19      128.2   P2p
Fa0/1        Desg FWD 19      128.1   P2p
Switch#

```

```

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
Spanning tree enabled protocol ieee
Root ID    Priority    32769
Address    0003.E488.35B1
Cost       19
Port       2(FastEthernet0/2)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
This bridge is the root
Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
Address    0003.E488.35B1
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface    Role Sts Cost    Prio.Nbr Type
-----
Fa0/2        Desg FWD 19      128.2   P2p
Fa0/1        Desg FWD 19      128.1   P2p
Switch#

```

Copy Paste

Коммутатор Switch0 является корневым, т.к. у него самый маленький MAC-адрес.

Time: 69:46:41 | Power Cycle Devices Fast Forward Time

Connections

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------

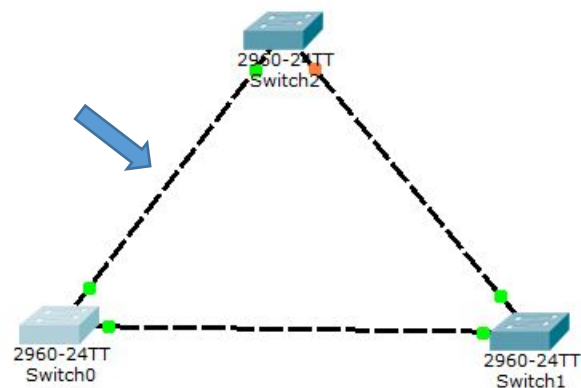
Automatically Choose Connection Type

Windows Taskbar: 19:25 10.10.2019



Logical

[Root]



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0003.E488.35B1
            This bridge is the root
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0003.E488.35B1
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
            Aging Time 20

Interface   Role Sts Cost      Prio.Nbr Type
-----
Fa0/2       Desg FWD 19        128.2   P2p
Fa0/1       Desg FWD 19        128.1   P2p

Switch#
```

Copy Paste

Проверим, что протокол STP работает. Попробуем отключить данный линк.

Time: 69:51:24 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





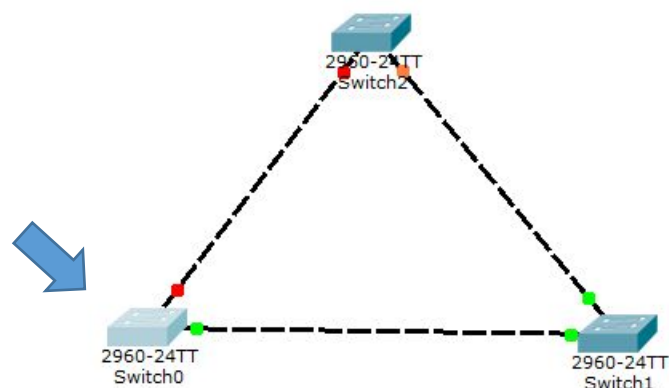
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int
Switch(config)#interface fa
Switch(config)#interface fastEthernet fa0/1

% Invalid input detected at '^' marker.

Switch(config)#in
Switch(config)#interface fa0/1
Switch(config-if)#sh
Switch(config-if)#shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively do
wn

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state t
o down

Switch(config-if)#
```

Copy Paste

Линк не работает. Переинициализация портов может занять несколько секунд.

Time: 70:00:02 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





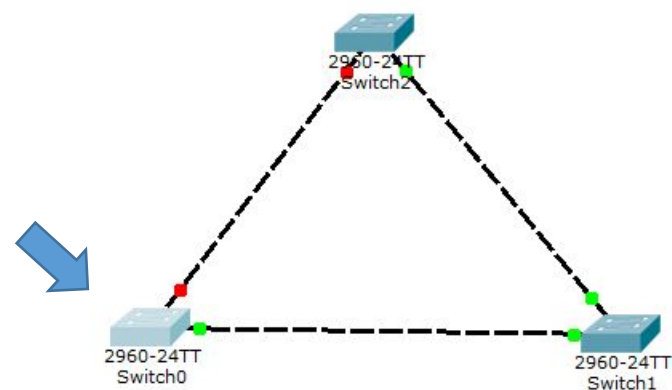
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int
Switch(config)#interface fa
Switch(config)#interface fastEthernet fa0/1

% Invalid input detected at '^' marker.

Switch(config)#in
Switch(config)#interface fa0/1
Switch(config-if)#sh
Switch(config-if)#shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively do
wn

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state t
o down

Switch(config-if)#

```

Copy Paste

Через 20-30 секунд связь восстановилась. Отказоустойчивость сработала.

Time: 70:02:42 Power Cycle Devices Fast Forward Time

Realtime



Connections



Coaxial

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete

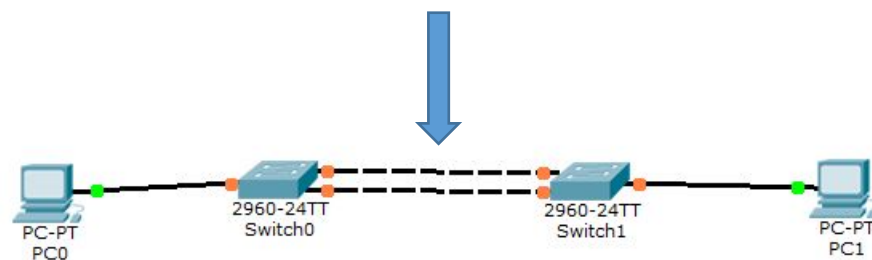




Logical [Root]

New Cluster Move Object Set Tiled Background Viewport

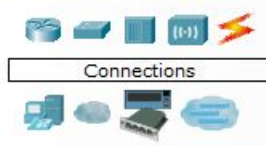
Рассмотрим другой пример. Соберём схему.



Образовалась коммутационная петля. Начинает работать протокол STP.

Time: 00:00:48 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





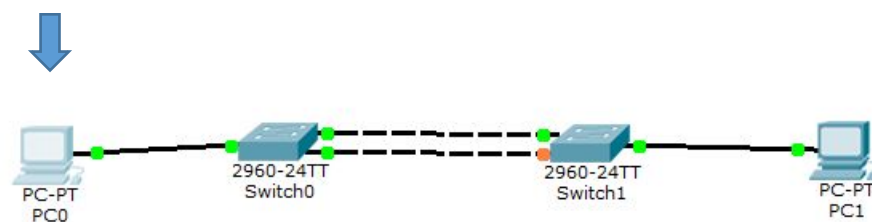
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



IP Configuration

IP Configuration

 DHCP Static
IP Address Subnet Mask Default Gateway DNS Server

IPv6 Configuration

 DHCP Auto Config Static
IPv6 Address / Link Local Address IPv6 Gateway IPv6 DNS Server 

Web Browser



Cisco IP Communicator

Настроим IP-адреса для компьютеров.

Time: 00:04:33 | Power Cycle Devices Fast Forward Time

Realtime



Connections



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete





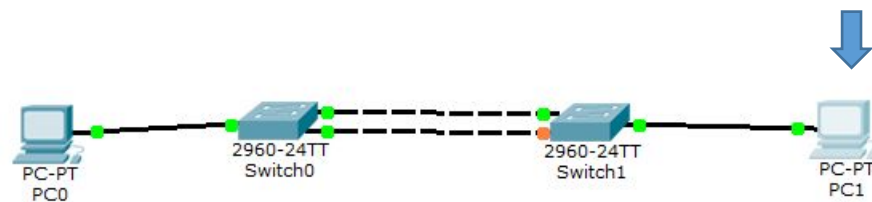
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



PC1

IP Configuration

IP Configuration

DHCP Static

IP Address

Subnet Mask

Default Gateway

DNS Server

IPv6 Configuration

DHCP Auto Config Static

IPv6 Address

Link Local Address

IPv6 Gateway

IPv6 DNS Server

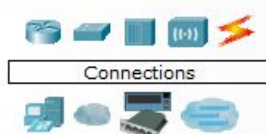
Web Browser

Cisco IP Communicator

Настроим 2-ой IP-адрес.

Time: 01:24:50 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





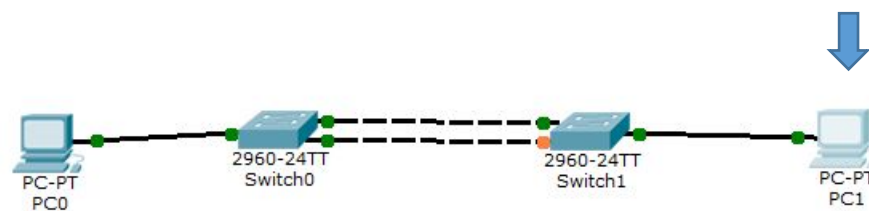
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



PC1

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC> ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=2ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128

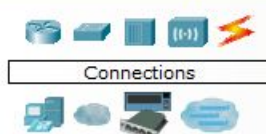
Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

PC>
```

Проверим связь компьютеров.

Time: 01:26:50 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





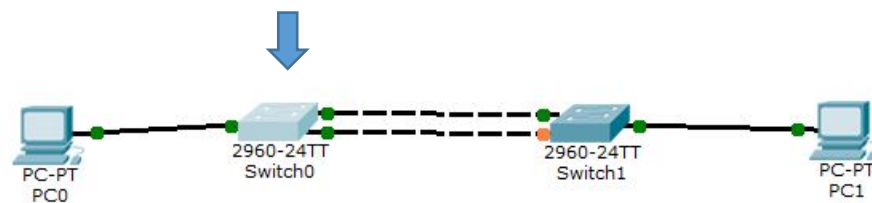
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
o up

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0004.9A83.70BB
            This bridge is the root
  Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0004.9A83.70BB
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface   Role Sts Cost      Prio.Nbr Type
-----
Fa0/2       Desg FWD 19        128.2   P2p
Fa0/1       Desg FWD 19        128.1   P2p
Fa0/3       Desg FWD 19        128.3   P2p

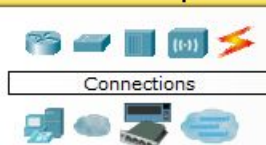
Switch#
```

Copy Paste

Данный коммутатор является корневым.

Time: 01:30:19 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





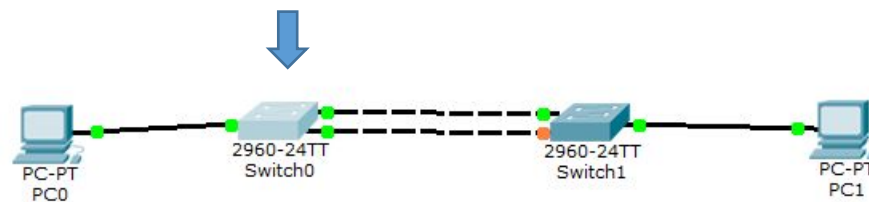
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```

o up

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0004.9A83.70BB
            This bridge is the root
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    0004.9A83.70BB
            Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
            Aging Time 20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/2        Desg FWD 19        128.2    P2p
Fa0/1        Desg FWD 19        128.1    P2p
Fa0/3        Desg FWD 19        128.3    P2p
Switch#
  
```

Copy Paste

Все его порты находятся в режиме передачи.

Time: 01:35:12 | Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

File	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete





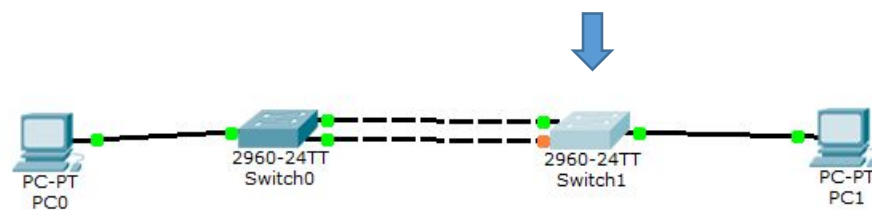
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```

Switch>en
Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
            Address    0004.9A83.70BB
            Cost      19
            Port      1(FastEthernet0/1)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
            Address    000A.4107.A066
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/2        Altn BLK 19        128.2    P2p
Fa0/3        Desg FWD 19        128.3    P2p
Fa0/1        Root FWD 19        128.1    P2p
Switch#

```

Copy Paste

На другом коммутаторе один порт заблокирован.

Time: 01:40:20 Power Cycle Devices Fast Forward Time

Realtime



Connections



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





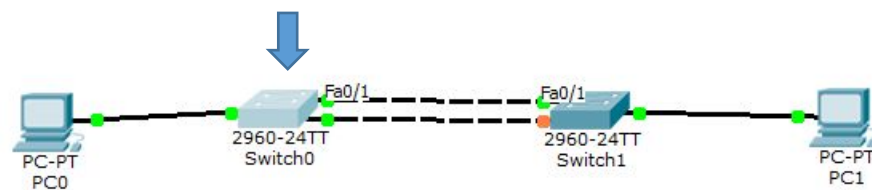
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch con0 is now available

Press RETURN to get started.

Switch>en
Switch#
```

Copy Paste

Проверим работу протокола STP. Для этого отключим порт Fa0/1 на Switch0.

Time: 01:44:40 Power Cycle Devices Fast Forward Time

Realtime

Connections



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





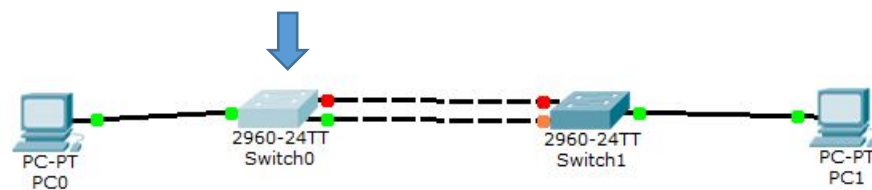
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa
Switch(config)#int fastEthernet 0/1
Switch(config-if)#shu
Switch(config-if)#shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively do
wn
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state t
o down

Switch(config-if)#
```

Copy Paste

Порт Fa0/1 на Switch0 отключен.

Time: 02:12:19 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





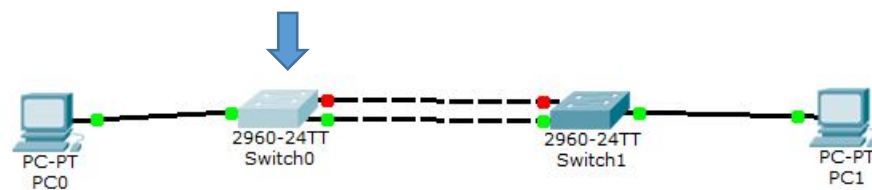
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa
Switch(config)#int fastEthernet 0/1
Switch(config-if)#shu
Switch(config-if)#shutdown

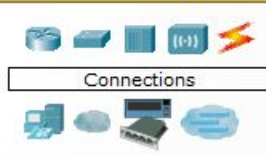
Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively do
wn
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state t
o down
Switch(config-if)#
```

Copy Paste

Связь восстановилась через другой порт, спустя 20-30 секунд. Чтобы сократить этот период попробуем настроить протокол RSTP (Rapid STP).

Time: 02:15:46 Power Cycle Devices Fast Forward Time

Realtime



Coaxial

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





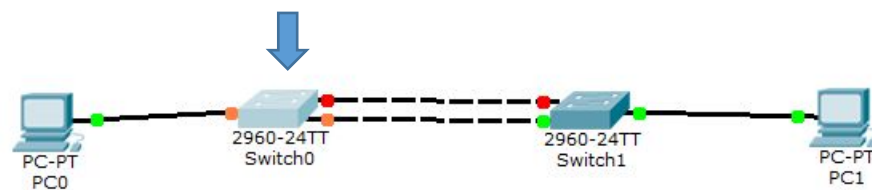
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

Press RETURN to get started.

```
Switch>en
Switch#conf t
Switch(config)#spanning-tree mode rapid-pvst
Switch(config)#
```

Copy Paste

Выполним команду: «spanning-tree mode rapid-pvst» (для запуска протокола RSTP)

Time: 02:26:26 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





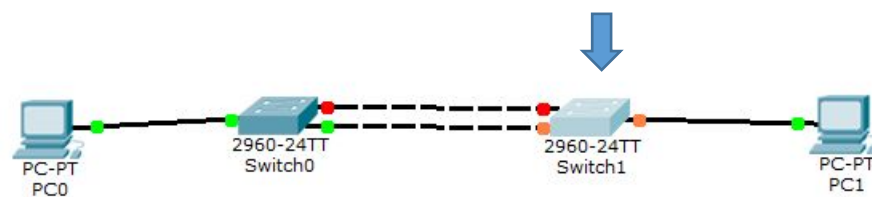
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#spa
Switch(config)#spanning-tree
% Incomplete command.
Switch(config)#spa
Switch(config)#spanning-tree mod
Switch(config)#spanning-tree mode ra
Switch(config)#spanning-tree mode rapid-pvst
Switch(config)#
```

Copy Paste

Тоже самое проделаем для другого коммутатора.

Time: 02:29:58 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```

Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#sho
Switch#show spa
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
            Address    0004.9A83.70BB
            Cost      19
            Port      2 (FastEthernet0/2)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
            Address    000A.4107.A066
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/2        Root FWD 19        128.2    P2p
Fa0/3        Desg FWD 19        128.3    P2p
Switch#

```

Copy Paste

Если выполнить команду:

«show spanning-tree», то увидим, что включен протокол RSTP.

Time: 02:33:12 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete

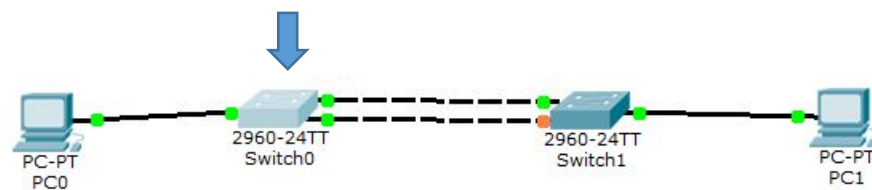




Logical

[Root]

New Cluster Move Object Set Tiled Background Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int
Switch(config)#interface fa0/1
Switch(config-if)#no sh
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

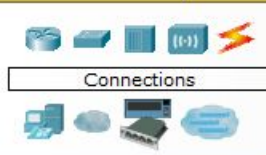
Switch(config-if)#
```

Copy Paste

Вновь подключим порт Fa0/1. Связь восстановилась очень быстро.

Time: 02:37:44 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





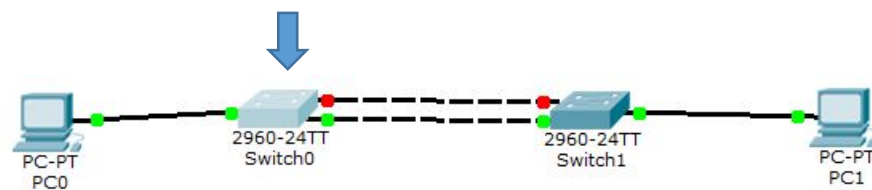
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int
Switch(config)#interface fa0/1
Switch(config-if)#no sh
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Switch(config-if)#sh
Switch(config-if)#shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
```

Copy Paste

Вновь отключим порт Fa0/1. Связь переключилась очень быстро.

Time: 02:42:57 Power Cycle Devices Fast Forward Time

Realtime



Automatically Choose Connection Type

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical [Root]

New Cluster Move Object Set Tiled Background Viewport

Рассмотрим метод агрегирования каналов.

Выбираем порт Fa0/3.

The screenshot shows the Cisco Packet Tracer interface. In the center, a network diagram is visible with three devices: PC-PT PC0 on the left, 2960-24TT Switch1 in the middle, and PC-PT PC1 on the right. A context menu is open over the switch, listing various ports. The port FastEthernet0/3 is highlighted in blue. The menu items are:

- Console
- FastEthernet0/1
- FastEthernet0/2
- FastEthernet0/3
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20
- FastEthernet0/21
- FastEthernet0/22
- FastEthernet0/23
- FastEthernet0/24
- GigabitEthernet1/1
- GigabitEthernet1/2

At the bottom of the interface, there is a 'Connections' panel, a 'Realtime' panel with a table, and a taskbar with various application icons. The taskbar shows the time as 22:40 on 10.10.2019.

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------



Logical

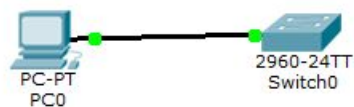
[Root]

New Cluster

Move Object Set Tiled Background

Viewport

Выбираем порт Fa0/3.



- Console
- FastEthernet0/1
- FastEthernet0/2
- FastEthernet0/3
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20
- FastEthernet0/21
- FastEthernet0/22
- FastEthernet0/23
- FastEthernet0/24
- GigabitEthernet1/1
- GigabitEthernet1/2

PC-PT
PC1

Time: 00:10:34 Power Cycle Devices Fast Forward Time



Copper Straight-T

Scenario 0

New

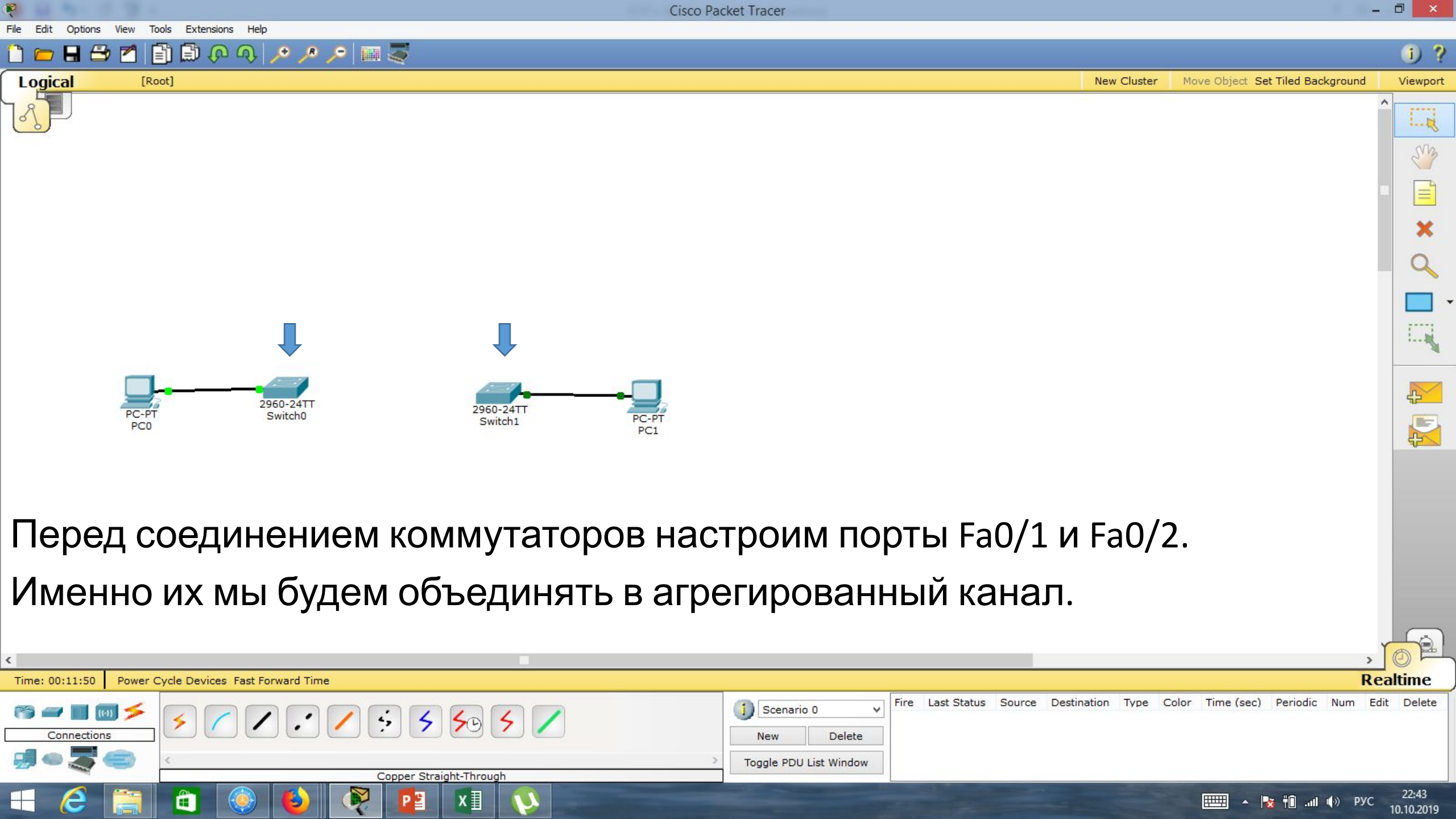
Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------

Realtime





Перед соединением коммутаторов настроим порты Fa0/1 и Fa0/2.
Именно их мы будем объединять в агрегированный канал.



Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
o down
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state t
o down
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state t
o down
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state t
o up

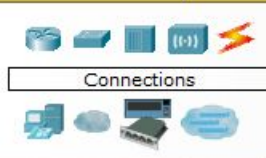
Switch>en
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int
Switch(config)#interface ra
Switch(config)#interface range fa0/1-2
Switch(config-if-range)#
```

Copy Paste

Редактируем сразу оба интерфейса Fa0/1, Fa0/2.

Time: 00:18:18 Power Cycle Devices Fast Forward Time

Realtime



Copper Straight-Through

Scenario 0

New

Delete

Toggle PDU List Window

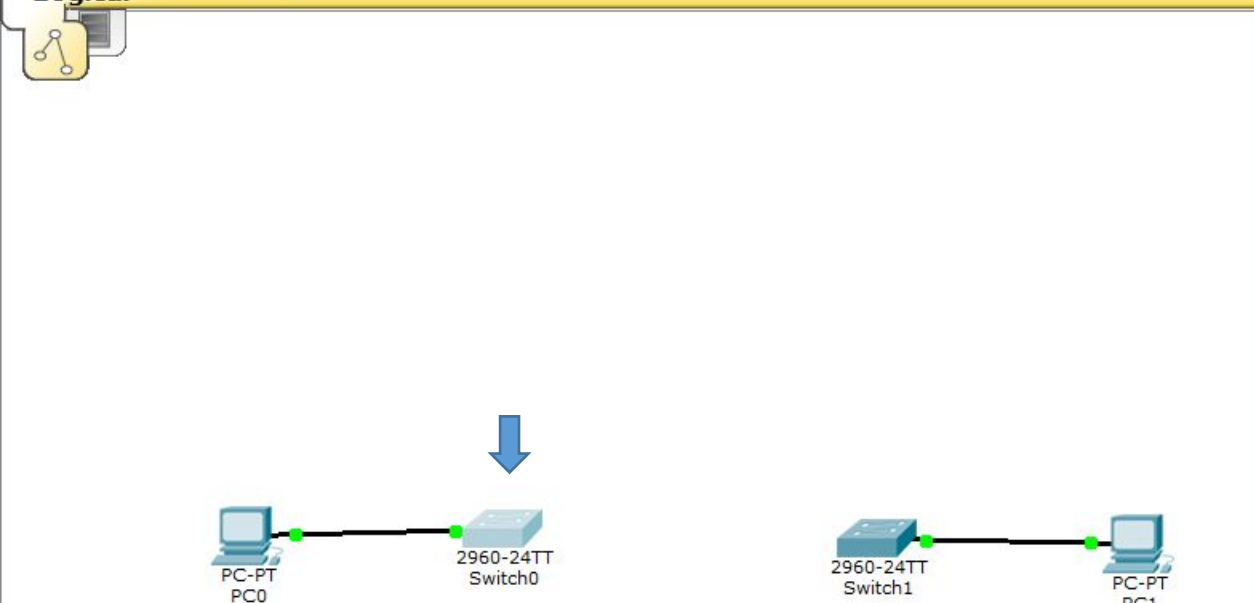
Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical [Root]

New Cluster Move Object Set Tiled Background Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#channel-gr
Switch(config-if-range)#channel-group 1 mod
Switch(config-if-range)#channel-group 1 mode ?
  active      Enable LACP unconditionally
  auto        Enable PAgP only if a PAgP device is detected
  desirable   Enable PAgP unconditionally
  on          Enable Etherchannel only
  passive     Enable LACP only if a LACP device is detected
Switch(config-if-range)#channel-group 1 mode
```

Copy Paste

Определяем оба интерфейса
в группу №1: «channel-group 1 mode». Выбираем «on».

Time: 00:24:43 Power Cycle Devices Fast Forward Time

Realtime



Copper Straight-Through

Scenario 0

New Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#channel-gr
Switch(config-if-range)#channel-group 1 mod
Switch(config-if-range)#channel-group 1 mode ?
  active      Enable LACP unconditionally
  auto        Enable PAgP only if a PAgP device is detected
  desirable   Enable PAgP unconditionally
  on          Enable Etherchannel only
  passive     Enable LACP only if a LACP device is detected
Switch(config-if-range)#channel-group 1 mode on
Switch(config-if-range)#
Creating a port-channel interface Port-channel 1

%LINK-5-CHANGED: Interface Port-channel 1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel 1, changed state to
up

Switch(config-if-range)#
```

Copy Paste

Создался интерфейс «Port-channel 1».

Time: 00:26:39 Power Cycle Devices Fast Forward Time

Realtime



Copper Straight-Through

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch0

Physical Config CLI

IOS Command Line Interface

```
passive Enable LACP only if a LACP device is detected
Switch(config-if-range)#channel-group 1 mode on
Switch(config-if-range)#
Creating a port-channel interface Port-channel 1

%LINK-5-CHANGED: Interface Port-channel 1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel 1, changed state to
up

Switch(config-if-range)#
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#rw mem
^
% Invalid input detected at '^' marker.

Switch#rw mam
^
% Invalid input detected at '^' marker.

Switch#wr mem
Building configuration...
[OK]
Switch#
```

Copy Paste

Сохраним конфигурацию.

Time: 00:31:48 Power Cycle Devices Fast Forward Time

Realtime



Connections



Copper Straight-Through



Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical

[Root]

New Cluster Move Object Set Tiled Background Viewport

Switch1

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int ra
Switch(config)#int range fa0/1-2
Switch(config-if-range)#channel-gr
Switch(config-if-range)#channel-group 1 mode on
Switch(config-if-range)#
Creating a port-channel interface Port-channel 1

%LINK-5-CHANGED: Interface Port-channel 1, changed state to up

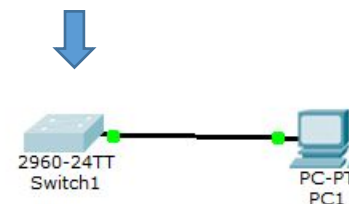
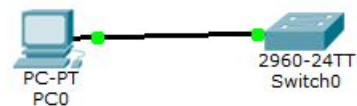
%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel 1, changed state to
up

Switch(config-if-range)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#wr mem
Building configuration...
[OK]
Switch#
```

Copy

Paste



Тоже проделываем для второго коммутатора.

Time: 00:37:26 Power Cycle Devices Fast Forward Time

Realtime



Connections



Copper Straight-Through

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





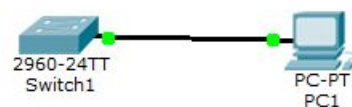
Logical [Root]

New Cluster Move Object Set Tiled Background Viewport

Соединяем коммутаторы.

PC-PT PC0

- Console
- FastEthernet0/1
- FastEthernet0/2
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20
- FastEthernet0/21
- FastEthernet0/22
- FastEthernet0/23
- FastEthernet0/24
- GigabitEthernet1/1
- GigabitEthernet1/2



Realtime

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------

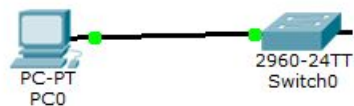




Logical [Root]

New Cluster Move Object Set Tiled Background Viewport

Соединяем коммутаторы.



- Console
- FastEthernet0/1
- FastEthernet0/2
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20
- FastEthernet0/21
- FastEthernet0/22
- FastEthernet0/23
- FastEthernet0/24
- GigabitEthernet1/1
- GigabitEthernet1/2

Time: 00:40:42 Power Cycle Devices Fast Forward Time



Copper Cross-

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete

Realtime





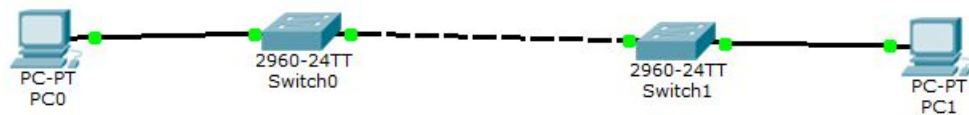
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Есть одно соединение.

Time: 00:41:55 | Power Cycle Devices Fast Forward Time

Realtime



Connections



Copper Cross-Over

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------

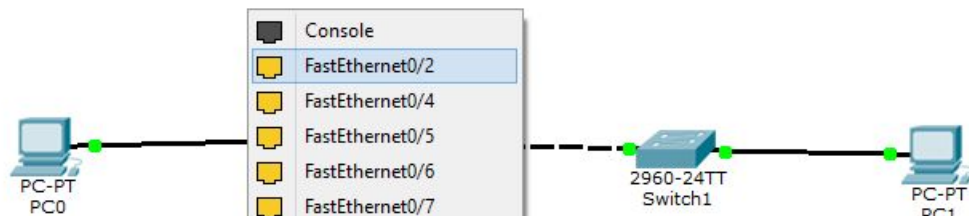




Logical [Root]

New Cluster Move Object Set Tiled Background Viewport

Соединяем коммутаторы.



- Console
- FastEthernet0/2
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20
- FastEthernet0/21
- FastEthernet0/22
- FastEthernet0/23
- FastEthernet0/24
- GigabitEthernet1/1
- GigabitEthernet1/2

Time: 00:41:24 Power Cycle Devices Fast

Connections



Realtime

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------



Logical

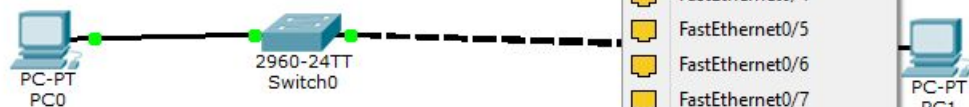
[Root]

New Cluster

Move Object Set Tiled Background

Viewport

Соединяем коммутаторы.



- Console
- FastEthernet0/2
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20
- FastEthernet0/21
- FastEthernet0/22
- FastEthernet0/23
- FastEthernet0/24
- GigabitEthernet1/1
- GigabitEthernet1/2

Time: 00:42:46 Power Cycle Devices Fast Forward Time



Copper Cross-

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------

Realtime





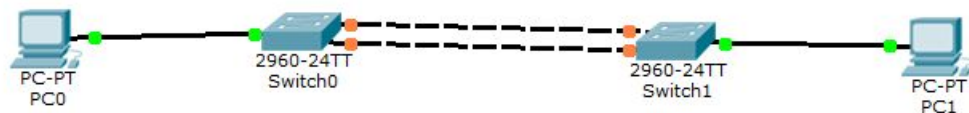
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Дождёмся инициализации портов.

Time: 00:43:02 Power Cycle Devices Fast Forward Time

Realtime

Connections



Copper Cross-Over

Scenario 0

New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



IP Configuration

IP Configuration

 DHCP StaticIP Address Subnet Mask Default Gateway DNS Server

IPv6 Configuration

 DHCP Auto Config StaticIPv6 Address Link Local Address IPv6 Gateway IPv6 DNS Server 

Web Browser



Cisco IP Communicator

Настроим IP-адреса для компьютеров.

Time: 00:45:14 Power Cycle Devices Fast Forward Time

Realtime



Copper Cross-Over



Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



IP Configuration

IP Configuration

 DHCP StaticIP Address Subnet Mask Default Gateway DNS Server

IPv6 Configuration

 DHCP Auto Config StaticIPv6 Address Link Local Address IPv6 Gateway IPv6 DNS Server 

Web Browser



Cisco IP Communicator

Настроим 2-ой IP-адрес.

Time: 00:47:18 | Power Cycle Devices Fast Forward Time

Realtime



Copper Cross-Over

Scenario 0

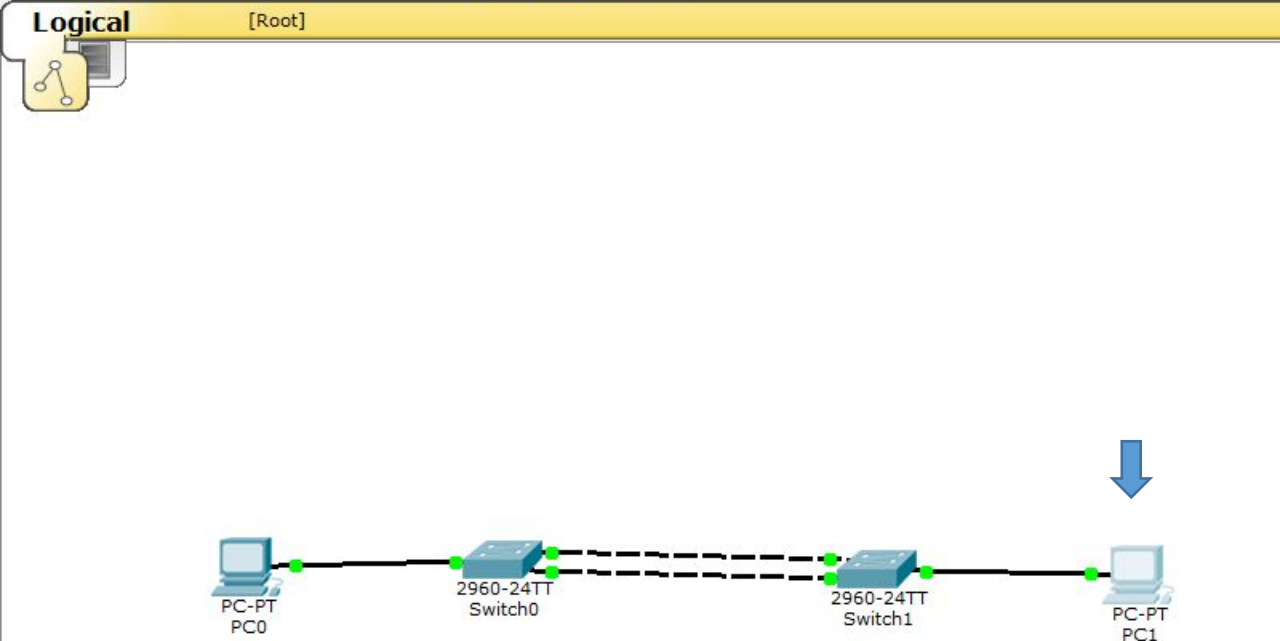
New

Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





PC1

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC> ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=2ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

PC>
```

Проверяем соединение.

Time: 00:49:30 Power Cycle Devices Fast Forward Time

Realtime

Connections



Copper Cross-Over

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





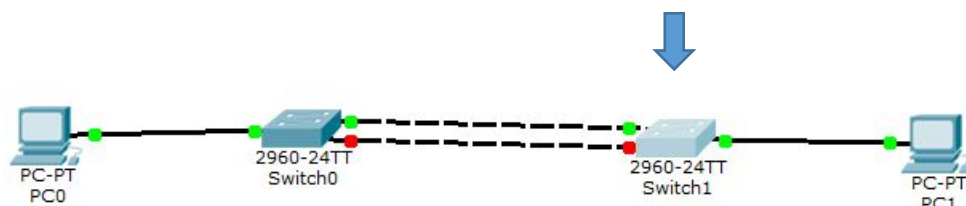
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```
Switch>en
Switch>enable
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa0/2
Switch(config-if)#shut
Switch(config-if)#shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively do
wn
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state t
o down
Switch(config-if)#
```

Copy Paste

Отключим порт Fa0/2.

Time: 00:53:35 Power Cycle Devices Fast Forward Time

Realtime



Serial DCE

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete





Logical

[Root]

New Cluster Move Object Set Tiled Background Viewport



PC1

Physical Config Desktop Custom Interface

Command Prompt

```
Pinging 192.168.1.1 with 32 bytes of data:  
  
Reply from 192.168.1.1: bytes=32 time=2ms TTL=128  
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128  
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128  
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128  
  
Ping statistics for 192.168.1.1:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 0ms, Maximum = 2ms, Average = 0ms  
  
PC> ping 192.168.1.1  
  
Pinging 192.168.1.1 with 32 bytes of data:  
  
Reply from 192.168.1.1: bytes=32 time=1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128  
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128  
Reply from 192.168.1.1: bytes=32 time=0ms TTL=128  
  
Ping statistics for 192.168.1.1:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 0ms, Maximum = 1ms, Average = 0ms  
  
PC>
```

Проверяем соединение.

Time: 00:55:52 Power Cycle Devices Fast Forward Time

Realtime



Copper Cross-Over

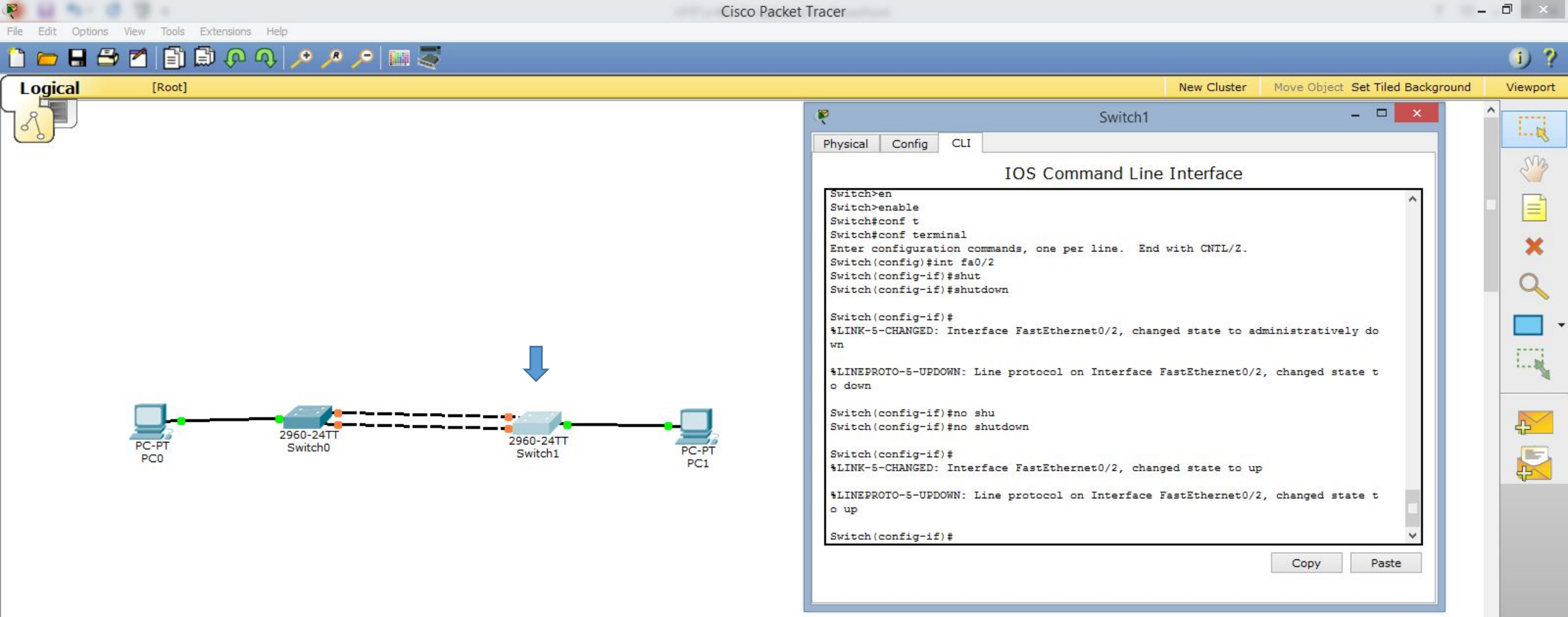
Scenario 0

New Delete

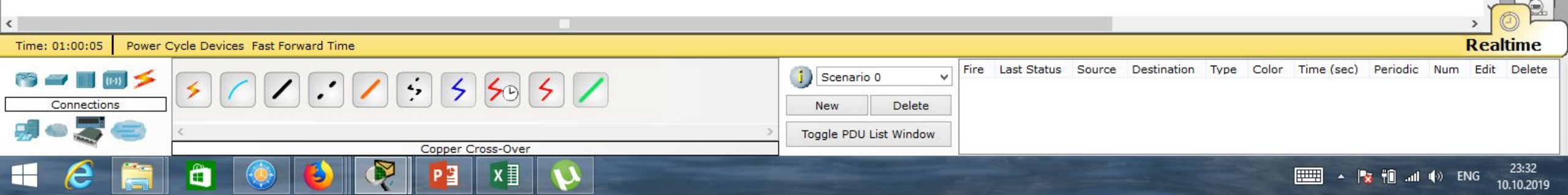
Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
------	-------------	--------	-------------	------	-------	------------	----------	-----	------	--------





Восстановление соединения Packet Tracer производит с ошибкой.





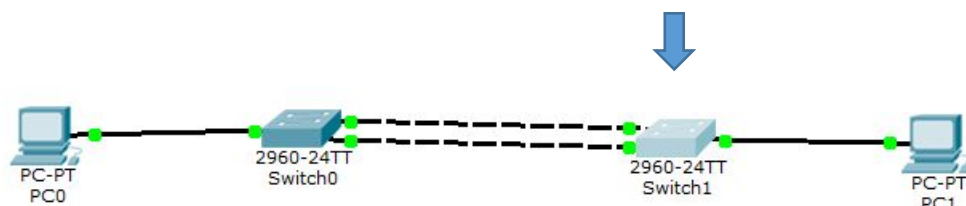
Logical

[Root]

New Cluster

Move Object Set Tiled Background

Viewport



Switch1

Physical Config CLI

IOS Command Line Interface

```
Switch>enable
Switch#conf t
Switch#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa0/2
Switch(config-if)#shut
Switch(config-if)#shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively do
wn

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state t
o down

Switch(config-if)#no shu
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state t
o up

Switch(config-if)#end
Switch#
```

Copy Paste

Соединение восстанавливается через несколько минут.

Time: 01:02:56 Power Cycle Devices Fast Forward Time

Realtime



Copper Cross-Over

Scenario 0

New

Delete

Toggle PDU List Window

Fire Last Status Source Destination Type Color Time (sec) Periodic Num Edit Delete



Маска подсети	Маска в двоичной системе	Префикс	Количество адресов	Обратная маска
255.255.255.255	11111111.11111111.11111111.11111111	/32	1	0.0.0.0
255.255.255.254	11111111.11111111.11111111.11111110	/31	2	0.0.0.1
255.255.255.252	11111111.11111111.11111111.11111100	/30	4	0.0.0.3
255.255.255.248	11111111.11111111.11111111.11111000	/29	8	0.0.0.7
255.255.255.240	11111111.11111111.11111111.11110000	/28	16	0.0.0.15
255.255.255.224	11111111.11111111.11111111.11100000	/27	32	0.0.0.31
255.255.255.192	11111111.11111111.11111111.11000000	/26	64	0.0.0.63
255.255.255.128	11111111.11111111.11111111.10000000	/25	128	0.0.0.127
255.255.255.0	11111111.11111111.11111111.00000000	/24	256	0.0.0.255
255.255.254.0	11111111.11111111.11111110.00000000	/23	512	0.0.1.255
255.255.252.0	11111111.11111111.11111100.00000000	/22	1024	0.0.3.255
255.255.248.0	11111111.11111111.11111000.00000000	/21	2048	0.0.7.255
255.255.240.0	11111111.11111111.11110000.00000000	/20	4096	0.0.15.255
255.255.224.0	11111111.11111111.11100000.00000000	/19	8192	0.0.31.255
255.255.192.0	11111111.11111111.11000000.00000000	/18	16384	0.0.63.255
255.255.128.0	11111111.11111111.10000000.00000000	/17	32768	0.0.127.255
255.255.0.0	11111111.11111111.00000000.00000000	/16	65536	0.0.255.255
255.254.0.0	11111111.11111110.00000000.00000000	/15	131072	0.1.255.255
255.252.0.0	11111111.11111100.00000000.00000000	/14	262144	0.3.255.255
255.248.0.0	11111111.11111000.00000000.00000000	/13	524288	0.7.255.255
255.240.0.0	11111111.11110000.00000000.00000000	/12	1048576	0.15.255.255

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Спасибо за внимание!

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