Лабораторная работа №5

По дисциплине «Телекоммуникационные системы и технологии»

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Санкт-Петербург

2022

Артефакты:

- Настройка маршрутизатора **Router A**

```
$ en && conf t
$ ip route 192.168.0.0 255.255.255.192 192.168.0.65
$ ip route 192.168.0.192 255.255.255.224 192.168.0.130
$ ip route 192.168.0.224 255.255.255.224 192.168.0.131
```

- Настройка маршрутизатора **Router B**

```
$ en && conf t
$ router rip
$ version 2
$ passive-interface fa1/0
$ network 192.168.1.0
$ no auto-summary
```

- Настройка BGP на **Router A**

```
$ en && conf t
$ router bgp 100
$ bgp log-neighbor-changes
$ neighbor 10.0.0.2 remote-as 101
$ neighbor 10.0.64.2 remote-as 102
$ neighbor 10.0.128.2 remote-as 103
$ network 192.168.0.0 mask 255.255.255.192
$ network 10.0.0.0 mask 255.255.192.0
$ network 192.168.0.128 mask 255.255.255.192
$ network 192.168.0.224 mask 255.255.255.224
```

$ network 192.168.0.192 mask 255.255.255.224

$ network 192.168.0.64 mask 255.255.255.192

$ network 10.0.64.0 mask 255.255.192.0

$ network 10.0.128.0 mask 255.255.192.0

- Настройка BGP на **Router B**

$ en && conf t

$ router bgp 101

$ bgp   log-neighbor-changes

$ neighbor 10.0.0.1 remote-as 100

$ neighbor 10.0.192.2 remote-as 102

$ neighbor 10.0.224.2 remote-as 103

$ network 10.0.0.0 mask 255.255.192.0

$ network 192.168.1.0

$ network 10.0.192.0 mask 255.255.224.0

$ network 10.0.224.0 mask 255.255.224.0

- Таблицы маршрутизации
    - для **Router A**:

```
        10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
C       10.0.0.0/18 is directly connected, FastEthernet4/0
C       10.0.64.0/18 is directly connected, FastEthernet5/0
C       10.0.128.0/18 is directly connected, FastEthernet6/0
B       10.0.192.0/19 [20/0] via 10.0.0.2, 00:00:00
B       10.0.224.0/19 [20/0] via 10.0.0.2, 00:00:00
        192.168.0.0/24 is variably subnetted, 5 subnets, 2 masks
S       192.168.0.0/26 [1/0] via 192.168.0.65
C       192.168.0.64/26 is directly connected, FastEthernet0/0
C       192.168.0.128/26 is directly connected, FastEthernet1/0
S       192.168.0.192/27 [1/0] via 192.168.0.130
S       192.168.0.224/27 [1/0] via 192.168.0.131
B    192.168.1.0/24 [20/0] via 10.0.0.2, 00:00:00
B    192.168.2.0/24 [20/0] via 10.0.64.2, 00:00:00
B    192.168.3.0/24 [20/0] via 10.0.128.2, 00:00:00
```

```
     10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
C       10.0.0.0/18 is directly connected, FastEthernet4/0
B       10.0.64.0/18 [20/0] via 10.0.0.1, 00:00:00
B       10.0.128.0/18 [20/0] via 10.0.0.1, 00:00:00
C       10.0.192.0/19 is directly connected, FastEthernet5/0
C       10.0.224.0/19 is directly connected, FastEthernet6/0
     192.168.0.0/24 is variably subnetted, 5 subnets, 2 masks
B       192.168.0.0/26 [20/0] via 10.0.0.1, 00:00:00
B       192.168.0.64/26 [20/0] via 10.0.0.1, 00:00:00
B       192.168.0.128/26 [20/0] via 10.0.0.1, 00:00:00
B       192.168.0.192/27 [20/0] via 10.0.0.1, 00:00:00
B       192.168.0.224/27 [20/0] via 10.0.0.1, 00:00:00
     192.168.1.0/24 is variably subnetted, 6 subnets, 3 masks
S       192.168.1.0/24 is directly connected, Null0
C       192.168.1.0/26 is directly connected, FastEthernet1/0
C       192.168.1.64/26 is directly connected, FastEthernet0/0
R       192.168.1.128/26 [120/1] via 192.168.1.66, 00:00:10, FastEthernet0/0
R       192.168.1.192/27 [120/2] via 192.168.1.66, 00:00:10, FastEthernet0/0
R       192.168.1.224/27 [120/2] via 192.168.1.66, 00:00:10, FastEthernet0/0
B    192.168.2.0/24 [20/0] via 10.0.192.2, 00:00:00
B    192.168.3.0/24 [20/0] via 10.0.224.2, 00:00:00
```

● **Отображение информации по Neighbor with edge AS 101**

```
Router#sh ip bgp neighbors
BGP neighbor is 10.0.0.2,  remote AS 101, external link
  BGP version 4, remote router ID 192.168.1.65
  BGP state = Established, up for 01:34:03
  Last read 01:34:03, last write 01:34:03, hold time is 180, keepalive interval is 60
seconds
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0

                    Sent       Rcvd
    Opens:            1          1
    Notifications:    0          0
    Updates:          16         31
    Keepalives:       95         95
    Route Refresh:    0          16
    Total:            112        143
  Default minimum time between advertisements runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 24, neighbor version 6/0
 --More--
```

```
 For address family: IPv4 Unicast
  BGP table version 24, neighbor version 6/0
  Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                                   Sent        Rcvd
  Prefix activity:                 ----        ----
    Prefixes Current:               16          13 (Consumes 667 bytes)
    Prefixes total:                 16          13
    Implicit Withdraw:               0           0
    Explicit Withdraw:               0           0
    Used as bestpath:              n/a           1
    Used as multipath:             n/a           0

                                      Outbound    Inbound
      Local Policy Denied Prefixes:   --------    -------
        Total:                            0           0
      Number of NLRIs in the update sent: max 3, min 1

  Address tracking is enabled, the RIB does have a route to 10.0.0.2
  Connections established 1; dropped 0
  Last reset never
  Transport(tcp) path-mtu-discovery is enabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Minimum incoming TTL 0, Outgoing TTL 1
Local host: 10.0.0.1, Local port: 179
Foreign host: 10.0.0.2, Foreign port: 1026
Connection tableid (VRF): 0

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xC69F4):
Timer          Starts    Wakeups          Next
 --More-- |
```

```
Event Timers (current time is 0xC69F4):
Timer          Starts    Wakeups          Next
Retrans            0         0            0x0
TimeWait           0         0            0x0
AckHold          126         0            0x0
SendWnd            0         0            0x0
KeepAlive         95         0            0x0
GiveUp             0         0            0x0
PmtuAger           0         0            0x0
DeadWait           0         0            0x0
Linger             0         0            0x0
ProcessQ           0         0            0x0

iss: 2057115318  snduna: 2057115748  sndnxt: 2057115748    sndwnd:  15955
irs: 3480424370  rcvnxt: 3480424751  rcvwnd:       16004  delrcvwnd:    380

SRTT: 259 ms, RTTO: 579 ms, RTV: 320 ms, KRTT: 0 ms
minRTT: 16 ms, maxRTT: 300 ms, ACK hold: 200 ms
Status Flags: passive open, gen tcbs
Option Flags: nagle, path mtu capable
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 127 (out of order: 0), with data: 17, total data bytes: 408
Sent: 96 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with
data: 16, total data bytes: 384
 Packets received in fast path: 0, fast processed: 0, slow path: 0
 fast lock acquisition failures: 0, slow path: 0

BGP neighbor is 10.0.64.2,  remote AS 102, external link
  BGP version 4, remote router ID 192.168.2.1
  BGP state = Established, up for 00:52:50
  Last read 00:52:50, last write 00:52:50, hold time is 180, keepalive interval is 60
seconds
 --More-- |
```

```
 Neighbor capabilities:
   Route refresh: advertised and received(new)
   Address family IPv4 Unicast: advertised and received
 Message statistics:
   InQ depth is 0
   OutQ depth is 0

                        Sent       Rcvd
   Opens:                  1          1
   Notifications:          0          0
   Updates:               17         15
   Keepalives:            53         53
   Route Refresh:          0          2
   Total:                 71         71
 Default minimum time between advertisements runs is 30 seconds

For address family: IPv4 Unicast
 BGP table version 24, neighbor version 6/0
 Output queue size : 0
 Index 1, Offset 0, Mask 0x2
 1 update-group member
                        Sent       Rcvd
 Prefix activity:        ----       ----
   Prefixes Current:       17         13 (Consumes 690 bytes)
   Prefixes total:         17         13
   Implicit Withdraw:       0          0
   Explicit Withdraw:       0          0
   Used as bestpath:      n/a          1
   Used as multipath:     n/a          0

                                Outbound    Inbound
     Local Policy Denied Prefixes:  --------    -------
        Total:                        0          0
--More--
```

```
        Total:                                  0          0
     Number of NLRIs in the update sent: max 3, min 1

  Address tracking is enabled, the RIB does have a route to 10.0.64.2
  Connections established 1; dropped 1
  Last reset never
  Transport(tcp) path-mtu-discovery is enabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Minimum incoming TTL 0, Outgoing TTL 1
Local host: 10.0.64.1, Local port: 179
Foreign host: 10.0.64.2, Foreign port: 1025
Connection tableid (VRF): 0

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xC69F4):
Timer          Starts   Wakeups          Next
Retrans            0        0            0x0
TimeWait           0        0            0x0
AckHold           68        0            0x0
SendWnd            0        0            0x0
KeepAlive         53        0            0x0
GiveUp             0        0            0x0
PmtuAger           0        0            0x0
DeadWait           0        0            0x0
Linger             0        0            0x0
ProcessQ           0        0            0x0

iss: 2057115318  snduna: 2057115748  sndnxt: 2057115748     sndwnd:  15955
irs: 3480424370  rcvnxt: 3480424751  rcvwnd:         16004  delrcvwnd:   380

SRTT: 259 ms, RTTO: 579 ms, RTV: 320 ms, KRTT: 0 ms
minRTT: 16 ms, maxRTT: 300 ms, ACK hold: 200 ms
Status Flags: passive open, gen tcbs
 --More--
```

```
Status Flags: passive open, gen tcbs
Option Flags: nagle, path mtu capable
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 69 (out of order: 0), with data: 2, total data bytes: 48
Sent: 54 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with
data: 17, total data bytes: 408
 Packets received in fast path: 0, fast processed: 0, slow path: 0
 fast lock acquisition failures: 0, slow path: 0

BGP neighbor is 10.0.128.2,  remote AS 103, external link
  BGP version 4, remote router ID 192.168.3.1
  BGP state = Established, up for 00:47:52
  Last read 00:47:52, last write 00:47:52, hold time is 180, keepalive interval is 60
seconds
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0

                      Sent        Rcvd
    Opens:              1           1
    Notifications:      0           0
    Updates:            19          15
    Keepalives:         48          48
    Route Refresh:      0           2
    Total:              68          66
  Default minimum time between advertisements runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 24, neighbor version 6/0
 --More--
```

```
  BGP table version 24, neighbor version 6/0
  Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                          Sent        Rcvd
  Prefix activity:        ----        ----
    Prefixes Current:      19          13 (Consumes 736 bytes)
    Prefixes total:        19          13
    Implicit Withdraw:      0           0
    Explicit Withdraw:      0           0
    Used as bestpath:      n/a          1
    Used as multipath:     n/a          0

                             Outbound    Inbound
     Local Policy Denied Prefixes:    --------    -------
       Total:                          0           0
     Number of NLRIs in the update sent: max 3, min 1

  Address tracking is enabled, the RIB does have a route to 10.0.128.2
  Connections established 1; dropped 1
  Last reset never
  Transport(tcp) path-mtu-discovery is enabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Minimum incoming TTL 0, Outgoing TTL 1
Local host: 10.0.128.1, Local port: 179
Foreign host: 10.0.128.2, Foreign port: 1025
Connection tableid (VRF): 0

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xC69F4):
Timer           Starts    Wakeups          Next
Retrans            0         0              0x0
TimeWait           0         0              0x0
 --More--
```

```
TimeWait              0          0              0x0
AckHold              63          0              0x0
SendWnd               0          0              0x0
KeepAlive            48          0              0x0
GiveUp                0          0              0x0
PmtuAger              0          0              0x0
DeadWait              0          0              0x0
Linger                0          0              0x0
ProcessQ              0          0              0x0

iss: 2057115318  snduna: 2057115748  sndnxt: 2057115748     sndwnd:  15955
irs: 3480424370  rcvnxt: 3480424751  rcvwnd:        16004  delrcvwnd:    380

SRTT: 259 ms, RTTO: 579 ms, RTV: 320 ms, KRTT: 0 ms
minRTT: 16 ms, maxRTT: 300 ms, ACK hold: 200 ms
Status Flags: passive open, gen tcbs
Option Flags: nagle, path mtu capable
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 64 (out of order: 0), with data: 2, total data bytes: 48
Sent: 49 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with
data: 19, total data bytes: 456
 Packets received in fast path: 0, fast processed: 0, slow path: 0
 fast lock acquisition failures: 0, slow path: 0


Router#
Router#
```