



JUNIPER
NETWORKS

Сервисы EVPN / MPLS

практика

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Доступ к стенду

SSID:

Password:

Lab Guide:

192.168.1.10X

root

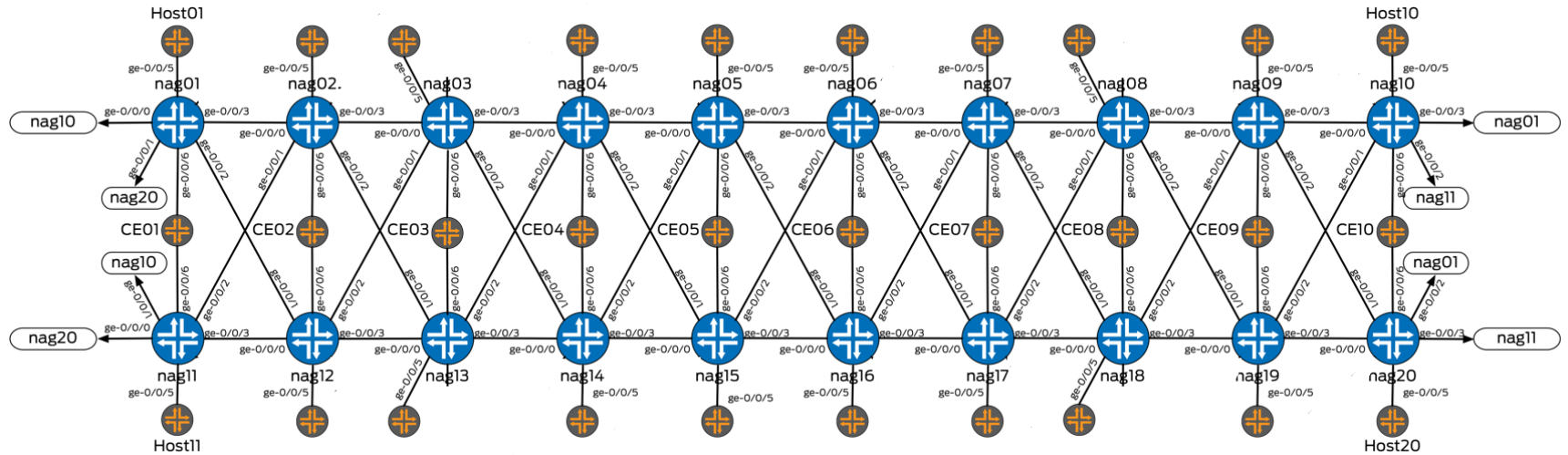
snrsnr

A woman with dark hair is looking down at a tablet computer. The image has a blue tint and semi-transparent data visualizations overlaid, including a world map, a bar chart, and a pie chart. The background shows a bookshelf.

Программа

- ✓ Подготовка сети
 - ✓ IGP (OSPF)
 - ✓ MPLS, RSVP
 - ✓ LSP
- ✓ Настройка сервисов EVPN
 - ✓ Vlan-based, EVPN
 - ✓ Multi-home Active/Active
 - ✓ Routing: L3 VPN + EVPN
 - ✓ VxLAN
 - ✓ VxLAN based EVPN

Схема стенда



Лабораторный стенд базируется на программном продукте VMX. На данной схеме представлены основные компоненты стенда

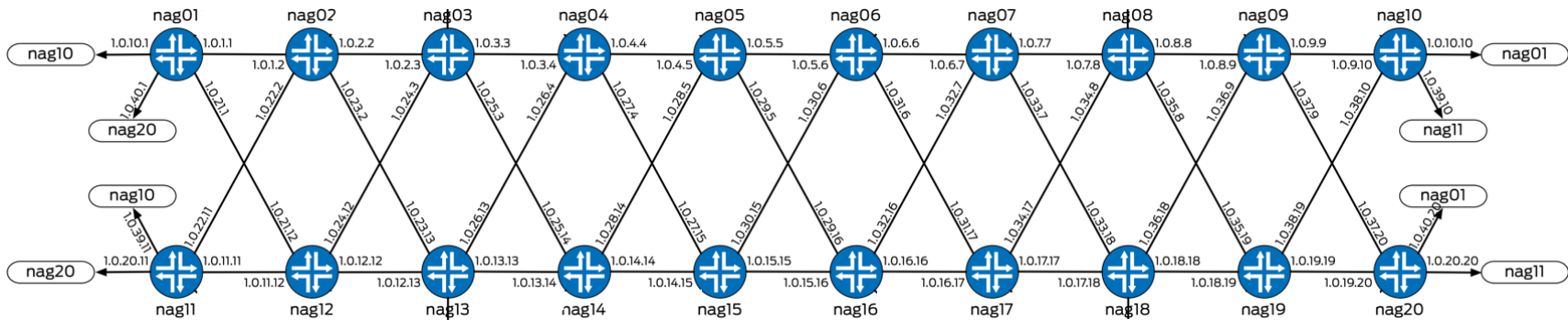
Маршрутизаторы для настройки

Хосты для проверки функционала

На схеме поднимается underlay база - OSPF, BGP, MPLS

На схеме поднимается overlay - VxLAN/EVPN

Схема IP адресации



На схеме представлена базовая маршрутизация сети - стыковочные сети для работы. Более детально будет показано ниже.

Доступ к стенду: vMX маршрутизаторы

Маршрутизаторы nag01...nag20:

SSH Login:

Password:

! Каждый участник настраивает свой маршрутизатор

Доступ к стенду: Linux хосты (single home)

Для имитации проверочных хостов используется функционал `virtual-router` для проверки работы EVPN-MPLS создана логическая заколка внутри виртуальной машины - порты `ge-0/0/4` - `ge-0/0/5`

Доступ к стенду: Linux хосты (multi home)

Linux хосты ce01...ce10: 10.200.0.151 – 10.0.200.160

SSH Login:

Password:

Каждый хост подключен к паре маршрутизаторов:

ce01: nag01 и nag11

ce02: nag02 и nag12

...

ce09: nag09 и nag19

ce10: nag10 и nag20

Со стороны Linux преднастроен LAG (bond интерфейс) + LACP

Для имитации проверочного хоста используется оборудование EX2200 + функционал virtual-router, со своей парой портов согласно дескрипторам

IP адресация стенда

Loopback интерфейсы

rag01: 1.255.255.101/32

...

rag20: 1.255.255.120/32

Стыковочные сети

Между ragXX: 1.0.YY.XX/24

XX – номер маршрутизатора

YY – порядковый номер (см.схему)



Core Network

OSPF, MPLS, RSVP, LSP, BGP

Настройка IP адресации на интерфейсах

Описание интерфейса (пример для nag01):

```
set interfaces ge-0/0/0 description nag01-nag10
set interfaces ge-0/0/1 description nag01-nag20
set interfaces ge-0/0/2 description nag01-nag12
set interfaces ge-0/0/3 description nag01-nag02
```

Настройка IPv4 адреса:

```
set interfaces ge-0/0/x unit 0 family inet address 1.0.yy.xx/24
```

Настроить необходимо все необходимые интерфейсы согласно схеме

Настройка Loopback интерфейса:

```
set interfaces lo0 unit 0 family inet address 1.255.255.xxx/32
```

Проверка связности с соседом:

```
dm@nagXX-re> ping 1.0.yy.xx
```

Конфигурация IGP маршрутизации

Настройка протокола OSPF:

```
set protocols ospf area 0.0.0.0 interface <int name> interface-type p2p
```

Настроить необходимо все интерфейсы участвующие в процессе

Включение поддержки MPLS TE для OSPF:

```
set protocols ospf traffic-engineering
```

Router ID:

```
set routing-options router-id 1.255.255.xxx <-- адрес lo0
```

Балансировка ECMP:

```
set policy-options policy-statement lb then load-balance per-packet
```

```
set routing-options forwarding-table export lb
```

Проверка OSPF

Проверка соседства:

```
show ospf neighbor
```

Ожидаемый результат:

```
dm@nag01-re> show ospf neighbor
```

Address	Interface	State	ID	Pri	Dead
1.0.10.10	ge-	Full	1.255.255.110	128	39
1.0.40.20	ge-	Full	1.255.255.120	128	35
1.0.21.12	ge-	Full	1.255.255.112	128	37
1.0.1.2	ge-	Full	1.255.255.102	128	31

Проверка установленных маршрутов в RIB:

```
show route protocol ospf
```

Настройка протокола BGP

Настройка глобальной автономной системы:

```
set routing-options autonomous-system 65000
```

Настройка iBGP группы:

```
set protocols bgp group int type internal  
set protocols bgp group int local-address 1.255.255.101
```

Включение в BGP анонсы VPNv4 и EVPN:

```
set protocols bgp group int family inet-vpn any  
set protocols bgp group int family evpn signaling
```

Настройка iBGP сессии в режиме full mesh

```
set protocols bgp group int neighbor 1.255.255.xx  
Сессию со всеми активными соседями
```

Проверка состояния сессий:

```
show bgp summary
```

Конфигурация MPLS

Включение MPLS на core-интерфейсах:

```
set interfaces <int name> unit 0 family mpls
```

Включение протокола MPLS:

```
set protocols mpls interface <int name>
```



Single home EVPN

VLAN-based и VLAN-aware bundle

IP адресация хостов для L2 EVPN сервисов

hXX: (XX - номер хоста от 01-20, 21,23,25,27)

EVPN vlan-aware bundle:

vlan 101 - 172.1.1.XX/24, mac: 00:11:00:11:00:XX

vlan 102 - 172.1.2.XX/24, mac: 00:11:00:12:00:XX

vlan 103 - 172.1.3.XX/24, mac: 00:11:00:13:00:XX

EVPN vlan-based:

vlan 200 - 172.2.0.XX/24, mac: 00:11:00:20:00:XX

ceXX (XX - номер linux хоста для multihome от 01 до 10):

EVPN vlan-aware bundle:

vlan 101 - 172.1.1.1XX/24, mac: 00:22:00:11:00:XX

vlan 102 - 172.1.2.1XX/24, mac: 00:22:00:12:00:XX

vlan 103 - 172.1.3.1XX/24, mac: 00:22:00:13:00:XX

EVPN vlan-based:

vlan 200 - 172.2.0.1XX/24, mac: 00:22:00:20:00:XX

! Преднастроено на linux хостах

Настройка Vlan-based EVPN сервиса

Конфигурация access интерфейса:

```
set interfaces <int name> description nag01-h1
set interfaces <int name> flexible-vlan-tagging
set interfaces <int name> encapsulation flexible-ethernet-services
set interfaces <int name> unit 1 encapsulation vlan-bridge
set interfaces <int name> unit 1 vlan-id 200
set interfaces <int name> unit 1 family bridge
```

Настройка routing instance для vlan 200:

```
set routing-instances evpn2 instance-type evpn
set routing-instances evpn2 vlan-id xxx
set routing-instances evpn2 interface <int name>
set routing-instances evpn2 route-distinguisher 1.255.255.xxx:2
set routing-instances evpn2 vrf-target target:65000:2
set routing-instances evpn2 protocols evpn
```

Проверка Vlan-based EVPN сервиса

Проверка связности от h01 (для nag01) к h21 (nag-a), h23 (nag-b), h25 (nag-c), h27 (nag-d):
root@h1:~# ping 172.2.0.27

Проверка evpn базы данных и mac таблицы:

```
dm@nag01-re> show evpn database
```

Instance: evpn2

VLAN	DomainId	MAC address	Active source	Timestamp	IP address
200		00:11:00:20:00:01	ge-0/0/5.1	Oct 16 07:57:17	
200		00:11:00:20:00:28	1.255.255.14	Oct 16 07:57:18	

```
dm@nag01-re> show evpn mac-table
```

MAC flags (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)

Routing instance : evpn2

Bridging domain : __evpn2__, VLAN : 200

MAC address	MAC flags	Logical interface	NH Index	MAC property
00:11:00:20:00:01	D	ge-0/0/5.1		
00:11:00:20:00:28	DC		1048585	

Проверка Vlan-based EVPN сервиса

Общее состояние EVPN инстанса:

```
dm@nag01-re> show evpn instance evpn2 extensive
```

```
Instance: evpn2
```

```
...
```

```
MAC database status          Local  Remote
MAC advertisements:         1      1
MAC+IP advertisements:      0      0
Default gateway MAC advertisements: 0      0
```

```
Number of local interfaces: 1 (1 up)
```

Interface name	ESI	Mode	Status	AC-Role
ge-0/0/5.1	00:00:00:00:00:00:00:00:00:00	single-homed	Up	Root

```
Number of IRB interfaces: 0 (0 up)
```

```
Number of bridge domains: 1
```

VLAN	Domain ID	Intfs / up	IRB intf	Mode	MAC sync	IM route label	SG sync	IM core	nexthop
200		1 / 1		Extended	Enabled	127	Disabled		

```
Number of neighbors: 5
```

Address	MAC	MAC+IP	AD	IM	ES Leaf-label
1.255.255.11	0	0	0	1	0
1.255.255.12	0	0	0	1	0
1.255.255.13	0	0	0	1	0
1.255.255.14	1	0	0	1	0
1.255.255.111	0	0	2	1	0

```
...
```

Проверка Vlan-based EVPN сервиса

Проверка BGP анонса для evpn mac адреса:

```
dm@nag01-re> show route table evpn2 evpn-mac-address 00:11:00:20:00:28
```

evpn2.evpn.0: 64 destinations, 250 routes (10 active, 0 holddown, 216 hidden)

+ = Active Route, - = Last Active, * = Both

```
2:1.255.255.14:2::200::00:11:00:20:00:28/304 MAC/IP
```

```
*[BGP/170] 00:04:09, localpref 100, from 1.255.255.14
  AS path: I, validation-state: unverified
  > to 1.0.10.10 via ge-0/0/0.0, label-switched-path nag01-nag-d
[BGP/170] 00:04:08, localpref 100, from 1.255.255.11
  AS path: I, validation-state: unverified
  > to 1.0.10.10 via ge-0/0/0.0, label-switched-path nag01-nag-d
[BGP/170] 00:04:08, localpref 100, from 1.255.255.12
  AS path: I, validation-state: unverified
  > to 1.0.10.10 via ge-0/0/0.0, label-switched-path nag01-nag-d
[BGP/170] 00:04:08, localpref 100, from 1.255.255.13
  AS path: I, validation-state: unverified
  > to 1.0.10.10 via ge-0/0/0.0, label-switched-path nag01-nag-d
```

Настройка Vlan-aware bundle EVPN сервиса

Конфигурация access интерфейса (добавляем unit):

```
set interfaces ge-0/0/5 unit 0 family bridge interface-mode trunk
set interfaces ge-0/0/5 unit 0 family bridge vlan-id-list 101-103
```

Настройка routing instance для vlan 101-103:

```
set routing-instances evpn1 instance-type virtual-switch
set routing-instances evpn1 interface ge-0/0/5.0
set routing-instances evpn1 route-distinguisher 1.255.255.101:1
set routing-instances evpn1 vrf-target target:65000:1
set routing-instances evpn1 protocols evpn extended-vlan-list 101-103
set routing-instances evpn1 bridge-domains net1 vlan-id-list 101-103
```

Проверка Vlan-aware bundle EVPN сервиса

Проверка связности от h01 (для nag01) к h21 (nag-a), h23 (nag-b), h25 (nag-c), h27 (nag-d):
root@h1:~# ping 172.2.0.27

Проверка evpn базы данных и mac таблицы:

```
dm@nag01-re> show evpn database
```

```
Instance: evpn1
```

VLAN	DomainId	MAC address	Active source	Timestamp	IP address
101		00:11:00:11:00:01	ge-0/0/5.0	Oct 16 08:05:43	
101		00:11:00:11:00:27	1.255.255.14	Oct 16 08:08:26	

```
...
```

```
dm@nag01-re> show bridge mac-table
```

MAC flags (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
0 -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)

```
Routing instance : evpn1
```

```
Bridging domain : net1-vlan-0101, VLAN : 101
```

MAC address	MAC flags	Logical interface	NH Index	MAC property
00:11:00:11:00:01	D	ge-0/0/5.0		
00:11:00:11:00:27	DC		1048612	



Multihome EVPN

Настройка Multi-home EVPN Active/Active

Добавляем ae0 интерфейс:

```
set chassis aggregated-devices ethernet device-count 1
```

Добавляем в LAG (ae0) один интерфейс, который подключен к CE

```
set interfaces <int name> description nag01-ce1  
set interfaces <int name> together-options 802.3ad ae0
```

Конфигурация ESI идентификатора:

```
set interfaces ae0 esi 00:01:01:01:01:01:01:01:01  
set interfaces ae0 esi all-active
```

Номер ESI сегмента должен быть одинаковым для одного конечного устройства, например, можно выбрать:

- для ce1: 00:01:01:01:01:01:01:01:01 (на nag01 и nag11)
- для ce2: 00:02:02:02:02:02:02:02:02 (на nag02 и nag12)
- ...
- для ce10: 00:10:10:10:10:10:10:10:10 (на nag10 и nag20)

Настройка Multi-home EVPN Active/Active

Конфигурация LACP протокола:

```
set interfaces ae0 aggregated-ether-options lacp active periodic fast
set interfaces ae0 aggregated-ether-options lacp system-id 01:01:01:01:01:01
```

Идентификатор System ID для LACP должен быть одинаковым для одного конечного устройства, например:

- для ce1: 01:01:01:01:01:01 (на nag01 и nag11)
- для ce2: 02:02:02:02:02:02 (на nag02 и nag12)
- ...
- для ce10: 10:10:10:10:10:10 (на nag10 и nag20)

Конфигурация access интерфейса

```
set interfaces ae0 description "multihome ce"
set interfaces ae0 flexible-vlan-tagging
set interfaces ae0 encapsulation flexible-ethernet-services
```

Настройка vlan 101-103 для сервиса vlan-aware bundle "evpn1"

```
set interfaces ae0 unit 0 family bridge interface-mode trunk
set interfaces ae0 unit 0 family bridge vlan-id-list 101-103
```

Настройка Multi-home EVPN Active/Active

Настройка `vlan 200` для сервиса `vlan-base "evpn2"`

```
set interfaces ae0 unit 1 encapsulation vlan-bridge
set interfaces ae0 unit 1 vlan-id 200
set interfaces ae0 unit 1 family bridge
```

Добавляем интерфейсы в `routing instance`:

```
set routing-instances evpn1 interface ae0.0
set routing-instances evpn2 interface ae0.1
```

Проверка Multi-home EVPN Active/Active

Проверка состояния LACP (необходимо проверить на паре устройств, например nag01 и nag11):

```
dm@nag01-re> show lacp interfaces
```

```
Aggregated interface: ae0
```

LACP state:	Role	Exp	Def	Dist	Col	Syn	Aggr	Timeout	Activity
ge-0/0/6	Actor	No	No	Yes	Yes	Yes	Yes	Fast	Active
ge-0/0/6	Partner	No	No	Yes	Yes	Yes	Yes	Fast	Active

LACP protocol:	Receive State	Transmit State	Mux State
ge-0/0/6	Current	Fast periodic	Collecting distributing

```
dm@nag11-re> show lacp interfaces
```

```
Aggregated interface: ae0
```

LACP state:	Role	Exp	Def	Dist	Col	Syn	Aggr	Timeout	Activity
ge-0/0/6	Actor	No	No	Yes	Yes	Yes	Yes	Fast	Active
ge-0/0/6	Partner	No	No	Yes	Yes	Yes	Yes	Fast	Active

LACP protocol:	Receive State	Transmit State	Mux State
ge-0/0/6	Current	Fast periodic	Collecting distributing

! Если LACP на одном из PE не поднялся, надо обсудить почему так и решить что делать :) .

Проверка Multi-home EVPN Active/Active

Проверка со стороны Linux CE:

Slave Interface: **eth2**

...

details partner lacp pdu:

system priority: 127

system mac address: 01:01:01:01:01:01

oper key: 1

port priority: 127

port number: 1

port state: 63

Slave Interface: **eth1**

MII Status: up

...

details partner lacp pdu:

system priority: 127

system mac address: 01:01:01:01:01:01

oper key: 1

port priority: 127

port number: 1

port state: 63

Проверка Multi-home EVPN Active/Active

Проверка со стороны удаленного хоста h24 связности с ce1:

```
root@h24:~# ping 172.1.1.101
```

Проверка mac таблицы

```
dm@nag-d-re> show bridge mac-table
```

MAC flags (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned
MAC)

Routing instance : evpn1

Bridging domain : net1-vlan-0101, VLAN : 101

MAC address	MAC flags	Logical interface	NH Index	MAC property
00:11:00:11:00:24	DC		1048593	
00:22:00:11:00:01	DC		1048683	

Проверка Multi-home EVPN Active/Active

```
dm@nag01-re> show bridge mac-table
```

```
MAC flags          (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC  
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)
```

```
Routing instance : evpn1
```

```
Bridging domain : net1-vlan-0101, VLAN : 101
```

MAC address	MAC flags	Logical interface	NH Index	MAC property
00:11:00:11:00:24	DC		1048585	
00:22:00:11:00:01	D	ae0.0		

```
dm@nag11-re> show bridge mac-table
```

```
MAC flags          (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC  
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)
```

```
Routing instance : evpn1
```

```
Bridging domain : net1-vlan-0101, VLAN : 101
```

MAC address	MAC flags	Logical interface	NH Index	MAC property
00:11:00:11:00:24	DC		1048581	
00:22:00:11:00:01	DRC	ae0.0		

Проверка Multi-home EVPN Active/Active

Проверка выбора Designated forwarder для ESI:

```
dm@nag01-re> show evpn instance evpn1 esi 00:01:01:01:01:01:01:01:01 extensive
```

...

```
Number of ethernet segments: 1
```

```
ESI: 00:01:01:01:01:01:01:01:01
```

```
Status: Resolved by IFL ae0.0
```

```
Local interface: ae0.0, Status: Up/Forwarding
```

```
Number of remote PEs connected: 1
```

Remote PE	MAC label	Aliasing label	Mode
1.255.255.111	0	74	all-active

```
DF Election Algorithm: MOD based
```

```
Designated forwarder: 1.255.255.111
```

```
Backup forwarder: 1.255.255.101
```

```
Last designated forwarder update: Oct 16 08:05:54
```

```
Advertised MAC label: 142
```

```
Advertised aliasing label: 142
```

```
Advertised split horizon label: 159
```


Проверка Multi-home EVPN Active/Active

Сравнение режимов передачи BUM трафика:

```
dm@nag01-re> show interfaces ae0.0 detail | find EVPN
  Protocol bridge, MTU: 1522, Generation: 222, Route table: 10, Mesh Group: __all_ces__, EVPN
multi-homed status: Blocking BUM Traffic to ESI,
  EVPN multi-homed ESI Split Horizon Label: 159
  Flags: Is-Primary, Trunk-Mode
```

```
dm@nag11-re> show interfaces ae0.0 detail | find EVPN
  Protocol bridge, MTU: 1522, Generation: 182, Route table: 8, Mesh Group: __all_ces__, EVPN
multi-homed status: Forwarding,
  EVPN multi-homed ESI Split Horizon Label: 76
  Flags: Trunk-Mode
```

IP адресация хостов для L3 VPN/EVPN сервисов

Преднастроенные хосты:

h22: 192.1.1.22/24, gw: 192.168.1.1 (nag-a)

h24: 192.1.2.24/24, gw: 192.168.2.1 (nag-b)

h26: 192.1.3.26/24, gw: 192.168.3.1 (nag-c)

h28: 192.1.4.28/24, gw: 192.168.4.1 (nag-d)

Static route: 172.0.0.0/8

Маршрутизаторы nag-a/b/c/d имеют независимый L3 VPN с L3 стыком с Linux хостами



Routing: L3 VPN + EVPN

Настройка L3 VPN для сервисов EVPN

Конфигурация L3 (IRB) интерфейсов:

```
set interfaces irb unit 101 family inet address 172.1.1.1xx/24
set interfaces irb unit 101 mac 00:55:00:11:00:xx
```

```
set interfaces irb unit 102 family inet address 172.1.2.1xx/24
set interfaces irb unit 102 mac 00:55:00:12:00:xx
```

```
set interfaces irb unit 103 family inet address 172.1.3.1xx/24
set interfaces irb unit 103 mac 00:55:00:13:00:xx
```

```
set interfaces irb unit 200 family inet address 172.2.0.1xx/24
set interfaces irb unit 200 mac 00:55:00:20:00:xx
```

! xx – номер маршрутизатора

! MAC адрес настраивается исключительно для удобства проверки результата

Настройка L3 VPN для сервисов EVPN

Устанавливаем опцию «не анонсировать default gateway community» для evpn1 и evpn2:

```
set routing-instances evpn1 protocols evpn default-gateway do-not-advertise
set routing-instances evpn2 protocols evpn default-gateway do-not-advertise
```

Переконфигурируем Bridge Domain для сервиса EVPN Vlan-aware bundle сервиса:

```
set routing-instances evpn1 bridge-domains net101 domain-type bridge
set routing-instances evpn1 bridge-domains net101 vlan-id 101
set routing-instances evpn1 bridge-domains net101 routing-interface irb.101
```

```
set routing-instances evpn1 bridge-domains net102 domain-type bridge
set routing-instances evpn1 bridge-domains net102 vlan-id 102
set routing-instances evpn1 bridge-domains net102 routing-interface irb.102
```

```
set routing-instances evpn1 bridge-domains net103 domain-type bridge
set routing-instances evpn1 bridge-domains net103 vlan-id 103
set routing-instances evpn1 bridge-domains net103 routing-interface irb.103
```

Устанавливаем L3 интерфейс для EVPN Vlan-base сервиса

```
set routing-instances evpn2 routing-interface irb.200
```

Настройка L3 VPN для сервисов EVPN

Настройка сервиса L3 VPN

```
set routing-instances l3vpn1 instance-type vrf
set routing-instances l3vpn1 interface irb.101
set routing-instances l3vpn1 interface irb.102
set routing-instances l3vpn1 interface irb.103
set routing-instances l3vpn1 interface irb.200
set routing-instances l3vpn1 route-distinguisher 1.255.255.xxx:111
set routing-instances l3vpn1 vrf-target target:65000:111
set routing-instances l3vpn1 vrf-table-label
```

Проверка L3 маршрутизации EVPN + L3 VPN

Просмотр таблицы маршрутизации vrf (nagXX, nag-a/b/c/d):

```
show route table l3vpn1.inet.0
```

Проверка связности с предустановленными Linux хостами:

```
route add -net 192.0.0.0/8 gw 172.2.0.x <- настройка static route на linux хостах hXX
```

```
ping 192.1.1.22
```

```
ping 192.1.2.24
```

```
ping 192.1.3.26
```

```
ping 192.1.4.28
```

Проверка L3 маршрутизации EVPN + L3 VPN

Проверка базы данных EVPN (дополнительная информация об IP адресах хостов):

```
lab@nag-a-re> show evpn instance evpn2 extensive
```

```
...
  MAC+IP advertisements:           0       1
...
```

```
dm@nag01-re> show evpn database
```

```
Instance: evpn1
```

VLAN	DomainId	MAC address	Active source	Timestamp	IP address
101		00:55:00:11:00:01	irb.101	Oct 17 07:23:04	172.1.1.101
102		00:55:00:12:00:01	irb.102	Oct 17 07:23:04	172.1.2.101
103		00:55:00:13:00:01	irb.103	Oct 17 07:23:04	172.1.3.101

```
Instance: evpn2
```

VLAN	DomainId	MAC address	Active source	Timestamp	IP address
200		00:11:00:20:00:01	ge-0/0/5.1	Oct 17 08:22:14	172.2.0.1
200		00:55:00:20:00:01	irb.200	Oct 17 07:23:04	172.2.0.101

Проверка L3 маршрутизации EVPN + L3 VPN

Проверка BGP анонса Type2 на локальном маршрутизаторе

```
dm@nag01-re> show route table evpn2 evpn-mac-address 00:11:00:20:00:01
```

```
evpn2.evpn.0: 65 destinations, 248 routes (11 active, 0 holddown, 216 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```
2:1.255.255.101:2::200::00:11:00:20:00:01/304 MAC/IP
```

```
*[EVPN/170] 00:02:13
```

```
Indirect
```

```
2:1.255.255.101:2::200::00:11:00:20:00:01::172.2.0.1/304 MAC/IP
```

```
*[EVPN/170] 00:02:13
```

```
Indirect
```

Проверка L3 маршрутизации EVPN + L3 VPN

Проверка BGP анонса Type2 на удаленном маршрутизаторе

```
lab@nag-a-re> show route table evpn2 evpn-mac-address 00:11:00:20:00:01
```

```
evpn2.evpn.0: 66 destinations, 258 routes (66 active, 0 holddown, 0 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```
2:1.255.255.101:2::200::00:11:00:20:00:01/304 MAC/IP
```

```
*[BGP/170] 00:43:32, localpref 100, from 1.255.255.101
```

```
AS path: I, validation-state: unverified
```

```
> to 2.0.12.12 via ge-0/0/1.0, label-switched-path nag-a-nag01
```

```
...
```

```
2:1.255.255.101:2::200::00:11:00:20:00:01::172.2.0.1/304 MAC/IP
```

```
*[BGP/170] 00:43:32, localpref 100, from 1.255.255.101
```

```
AS path: I, validation-state: unverified
```

```
> to 2.0.12.12 via ge-0/0/1.0, label-switched-path nag-a-nag01
```

```
...
```



Single Home VxLAN + EVPN

Настройка VxLAN

Для успешной работы нам необходимо настроить интерфейс который к котрому подключаются внешние объекты, объявить инстанс, и обозначить какие vni мы будем обрабатывать внутри этого инстанса:

Настройка основного инстанса для работы VxLAN на Juniper MX тип инстанса `virtual switch`.

```
set routing-instances VxLaN01 instance-type virtual-switch
```

Основной интерфейс для привязки наших vtep

```
set routing-instances VxLaN01 vtep-source-interface lo0.0
```

Для подключения внешних хостов (серверов/клиентов) используется интерфейс:

```
set routing-instances VxLaN01 interface ge-0/0/x.0
```

Задать необходимую bridge группу

```
set routing-instances VxLaN0x bridge-domains vlanxxx domain-type bridge
```

```
set routing-instances VxLaN0x bridge-domains vlanxxx vlan-id xxx
```

```
set routing-instances VxLaN0x bridge-domains vlanxxx vxlan vni yyyy
```

Настройка VxLAN based EVPN

Настройка продолжается внутри нашего инстанса, созданного для работы VxLAN. Для этого включается протокол EVPN, обозначаются основные параметры RD, RT:

Настройка основных параметров:

```
set routing-instances VxLaN01 route-distinguisher 1.255.255.xxx:4
set routing-instances VxLaN01 vrf-import EVPN-VRF-VXLAN
set routing-instances VxLaN01 vrf-target target:65000:1
set routing-instances VxLaN01 vrf-target auto
```

Настройка протокола EVPN - over - VxLAN

```
set routing-instances VxLaN01 protocols evpn encapsulation vxlan
set routing-instances VxLaN01 protocols evpn extended-vni-list all
set routing-instances VxLaN01 protocols evpn multicast-mode ingress-replication
```

Настройка VxLAN based EVPN

Проведение диагностики работы :

Можно посмотреть базу данных мак адресов EVPN

```
root@nag11> show evpn database
```

```
Instance: VxLaN0x
```

VLAN	DomainId	MAC address	Active source	Timestamp	IP address
3000		02:11:0a:0e:ff:f4	ge-0/0/x.y	Sep 30 05:05:56	172.2.0.111
3000		02:12:0a:0e:ff:f4	ge-0/0/x.y	Sep 30 05:05:56	172.2.0.112

*в силу специфики настройки хостов мак адрес является идентичным в обоих случаях.

проверка доступности хостов:

```
root@nag11> ping routing-instance VxH12 172.2.0.112
```

```
PING 172.2.0.112 (172.2.0.112): 56 data bytes
```

```
64 bytes from 172.2.0.112: icmp_seq=0 ttl=64 time=993.253 ms
```

```
64 bytes from 172.2.0.112: icmp_seq=1 ttl=64 time=13.525 ms
```

```
64 bytes from 172.2.0.112: icmp_seq=2 ttl=64 time=19.274 ms
```

```
64 bytes from 172.2.0.112: icmp_seq=3 ttl=64 time=2.728 ms
```

```
^C
```

```
--- 172.2.0.112 ping statistics ---
```

```
4 packets transmitted, 4 packets received, 0% packet loss
```

```
round-trip min/avg/max/stddev = 2.728/257.195/993.253/425.005 ms
```

Настройка VxLAN based EVPN

Проведение диагностики работы :

Можно посмотреть таблицу маршрутизации на оборудовании:

```
root@nag11> show route
VxLaN01.evpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

2:1.255.255.111:4::3000::02:11:0a:0e:ff:f4/304 MAC/IP
    *[EVPN/170] 00:01:07
    Indirect
2:1.255.255.111:4::3000::02:12:0a:0e:ff:f4/304 MAC/IP
    *[EVPN/170] 00:01:07
    Indirect
2:1.255.255.111:4::3000::02:11:0a:0e:ff:f4::172.2.0.111/304 MAC/IP
    *[EVPN/170] 00:01:07
    Indirect
2:1.255.255.111:4::3000::02:12:0a:0e:ff:f4::172.2.0.112/304 MAC/IP
    *[EVPN/170] 00:01:07
    Indirect
3:1.255.255.111:4::3000::1.255.255.111/248 IM
    *[EVPN/170] 01:14:20
    Indirect
3:1.255.255.112:4::3000::1.255.255.112/248 IM
    *[BGP/170] 01:10:38, localpref 100, from 1.255.255.112
    AS path: I, validation-state: unverified
    > to 1.0.11.12 via ge-0/0/3.0, label-switched-path nag11-nag12
```



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