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Fakulta elektrotechniky a informatiky  
Katedra informatiky

**SPS - Semestrální projekt**

**SPS - Semestral project**

## **Abstrakt**

SPS

**Klíčová slova:** SPS

## **Abstract**

SPS

**Keywords:** SPS

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## 1 Plán číslování VLAN a implementace VLAN

Název	Číslo	Popis
Klient 101	101	
Klient 102	102	
Klient 103	103	
Klient 301	301	
Klient 302	301	
Klient 303	303	
g	9	datový provoz
M	91	management VRF
MA	18	management VRF
unused	998	nevyužité porty
native	999	nativní

## 2 L2 v access a distribuční vrstvě

### 2.1 VLANs

do sh vlan

```
ALSW1(config)#do sh vlan
```

VLAN	Name	Status	Ports
1	default	active	
18	MA	active	Gi1/0
101	klient101	active	Gi0/3
102	klient102	active	
103	klient103	active	
301	server301	active	Gi0/0
302	server302	active	
303	server303	active	
998	unused	active	
999	native	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
18	enet	100018	1500	-	-	-	-	-	0	0
101	enet	100101	1500	-	-	-	-	-	0	0
102	enet	100102	1500	-	-	-	-	-	0	0
103	enet	100103	1500	-	-	-	-	-	0	0
301	enet	100301	1500	-	-	-	-	-	0	0
302	enet	100302	1500	-	-	-	-	-	0	0
303	enet	100303	1500	-	-	-	-	-	0	0
998	enet	100998	1500	-	-	-	-	-	0	0
999	enet	100999	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

Remote SPAN VLANs

Primary	Secondary	Type	Ports
---------	-----------	------	-------

Obrázek 1: ALSW1 VLANs

```

DLSW1(config)#do sh vlan

```

VLAN	Name	Status	Ports
1	default	active	Gi0/3
18	MA	active	
101	klient101	active	
102	klient102	active	
103	klient103	active	
301	server301	active	
302	server302	active	
303	server303	active	
998	unused	active	
999	native	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
18	enet	100018	1500	-	-	-	-	-	0	0
101	enet	100101	1500	-	-	-	-	-	0	0
102	enet	100102	1500	-	-	-	-	-	0	0
103	enet	100103	1500	-	-	-	-	-	0	0
301	enet	100301	1500	-	-	-	-	-	0	0
302	enet	100302	1500	-	-	-	-	-	0	0
303	enet	100303	1500	-	-	-	-	-	0	0
998	enet	100998	1500	-	-	-	-	-	0	0
999	enet	100999	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

```

Remote SPAN VLANs

```

Primary	Secondary	Type	Ports
---------	-----------	------	-------

Obrázek 2: DLSW1 VLANs

```
DLSW2(config)#do sh vlan
```

VLAN	Name	Status	Ports
1	default	active	Gi0/3
18	MA	active	
101	klient101	active	
102	klient102	active	
103	klient103	active	
301	server301	active	
302	server302	active	
303	server303	active	
998	unused	active	
999	native	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
18	enet	100018	1500	-	-	-	-	-	0	0
101	enet	100101	1500	-	-	-	-	-	0	0
102	enet	100102	1500	-	-	-	-	-	0	0
103	enet	100103	1500	-	-	-	-	-	0	0
301	enet	100301	1500	-	-	-	-	-	0	0
302	enet	100302	1500	-	-	-	-	-	0	0
303	enet	100303	1500	-	-	-	-	-	0	0
998	enet	100998	1500	-	-	-	-	-	0	0
999	enet	100999	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

Remote SPAN VLANs

---

Primary	Secondary	Type	Ports
---------	-----------	------	-------

Obrázek 3: DLSW2 VLANs

## 2.2 Trunks

do sh int trunk

```

ALSW1(config)#do sh int trunk

Port      Mode      Encapsulation  Status      Native vlan
Gi0/1     on        802.1q         trunking    999
Gi0/2     on        802.1q         trunking    999
Gi1/1     on        802.1q         trunking    999
Gi1/2     on        802.1q         trunking    999
Gi1/3     on        802.1q         trunking    999

Port      Vlans allowed on trunk
Gi0/1     18,101-103,301-303,999
Gi0/2     18,101-103,301-303,999
Gi1/1     998
Gi1/2     998
Gi1/3     998

Port      Vlans allowed and active in management domain
Gi0/1     18,101-103,301-303,999
Gi0/2     18,101-103,301-303,999
Gi1/1     998
Gi1/2     998
Gi1/3     998

Port      Vlans in spanning tree forwarding state and not pruned
Gi0/1     18,301-303,999
Gi0/2     18,101-103,999
Gi1/1     998
Gi1/2     998
Gi1/3     998

```

Obrázek 4: ALSW1 Trunks

```

DLSW1(config)#do sh int trunk

Port      Mode      Encapsulation  Status      Native vlan
Gi0/0     on        802.1q         trunking    999
Gi0/1     on        802.1q         trunking    999
Gi1/0     on        802.1q         trunking    999
Po1       on        802.1q         trunking    999

Port      Vlans allowed on trunk
Gi0/0     998
Gi0/1     18,101-103,301-303,999
Gi1/0     18,101-103,301-303,999
Po1       18,101-103,301-303,999

Port      Vlans allowed and active in management domain
Gi0/0     998
Gi0/1     18,101-103,301-303,999
Gi1/0     18,101-103,301-303,999
Po1       18,101-103,301-303,999

Port      Vlans in spanning tree forwarding state and not pruned
Gi0/0     998
Gi0/1     18,101-103,301-303,999
Gi1/0     18,101-103,301-303,999
Po1       18,101-103,301-303,999

```

Obrázek 5: DLSW1 Trunks



```
DLSW2(config)#do sh int trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi0/0	on	802.1q	trunking	999
Gi0/1	on	802.1q	trunking	999
Gi1/0	on	802.1q	trunking	999
Po1	on	802.1q	trunking	999

Port	Vlans allowed on trunk
Gi0/0	998
Gi0/1	18,101-103,301-303,999
Gi1/0	18,101-103,301-303,999
Po1	18,101-103,301-303,999

Port	Vlans allowed and active in management domain
Gi0/0	998
Gi0/1	18,101-103,301-303,999
Gi1/0	18,101-103,301-303,999
Po1	18,101-103,301-303,999

Port	Vlans in spanning tree forwarding state and not pruned
Gi0/0	998
Gi0/1	18,101-103,301-303,999
Gi1/0	18,101-103,301-303,999
Po1	101-103,301-303

Obrázek 6: DLSW2 Trunks

## 2.3 LACP

do sh etherchannel summary

```
DLSW1(config)#do sh etherchannel summary
```

Flags: D - down P - bundled in port-channel  
I - stand-alone s - suspended  
H - Hot-standby (LACP only)  
R - Layer3 S - Layer2  
U - in use N - not in use, no aggregation  
f - failed to allocate aggregator

M - not in use, minimum links not met  
m - not in use, port not aggregated due to minimum links not met  
u - unsuitable for bundling  
w - waiting to be aggregated  
d - default port

A - formed by Auto LAG

Number of channel-groups in use: 1  
Number of aggregators: 1

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi0/2(P) Gi0/3(s)

Obrázek 7: DLSW1 LACP

```

DLSW2(config)#do sh etherchannel summary
Flags:  D - down          P - bundled in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG

Number of channel-groups in use: 1
Number of aggregators:          1

Group  Port-channel  Protocol    Ports
-----+-----+-----+-----
1      Po1 (SU)      LACP        Gi0/2 (P)  Gi0/3 (s)

```

Obrázek 8: DLSW2 LACP

### 3 Spanning Tree

do sh spanning-tree

```
ALSW1(config)#do sh spanning-tree

VLAN0018
  Spanning tree enabled protocol rstp
  Root ID    Priority    32786
             Address    5254.0005.5cd0
             This bridge is the root
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32786 (priority 32768 sys-id-ext 18)
             Address    5254.0005.5cd0
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface                Role Sts Cost      Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4         128.2   P2p
Gi0/2                    Desg FWD 4         128.3   P2p
Gi1/0                    Desg FWD 4         128.5   P2p

VLAN0101
  Spanning tree enabled protocol rstp
  Root ID    Priority    28773
             Address    5254.0016.6c37
             Cost        9
             Port        3 (GigabitEthernet0/2)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32869 (priority 32768 sys-id-ext 101)
             Address    5254.0005.5cd0
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface                Role Sts Cost      Prio.Nbr Type
-----
Gi0/1                    Altn BLK 20         128.2   P2p
Gi0/2                    Root FWD 5         128.3   P2p
Gi0/3                    Desg FWD 4         128.4   P2p Edge
```

Obrázek 9: ALSW1 SPT 1/5

```

VLAN0102
Spanning tree enabled protocol rstp
Root ID      Priority    28774
              Address    5254.0016.6c37
              Cost       9
              Port       3 (GigabitEthernet0/2)
              Hello Time  2 sec   Max Age 20 sec   Forward Delay 15 sec

Bridge ID     Priority    32870 (priority 32768 sys-id-ext 102)
              Address    5254.0005.5cd0
              Hello Time  2 sec   Max Age 20 sec   Forward Delay 15 sec
              Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Altn BLK 20      128.2   P2p
Gi0/2          Root FWD 5        128.3   P2p

VLAN0103
Spanning tree enabled protocol rstp
Root ID      Priority    28775
              Address    5254.0016.6c37
              Cost       9
              Port       3 (GigabitEthernet0/2)
              Hello Time  2 sec   Max Age 20 sec   Forward Delay 15 sec

Bridge ID     Priority    32871 (priority 32768 sys-id-ext 103)
              Address    5254.0005.5cd0
              Hello Time  2 sec   Max Age 20 sec   Forward Delay 15 sec
              Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Altn BLK 20      128.2   P2p
Gi0/2          Root FWD 5        128.3   P2p

```

Obrázek 10: ALSW1 SPT 2/5

```

VLAN0301
  Spanning tree enabled protocol rstp
  Root ID      Priority    24877
              Address     5254.0016.6c37
              Cost        5
              Port        2 (GigabitEthernet0/1)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID    Priority    33069 (priority 32768 sys-id-ext 301)
              Address     5254.0005.5cd0
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time   300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/0          Desg FWD 4        128.1   P2p Edge
Gi0/1          Root FWD 5        128.2   P2p
Gi0/2          Altn BLK 20    128.3   P2p

VLAN0302
  Spanning tree enabled protocol rstp
  Root ID      Priority    24878
              Address     5254.0016.6c37
              Cost        5
              Port        2 (GigabitEthernet0/1)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID    Priority    33070 (priority 32768 sys-id-ext 302)
              Address     5254.0005.5cd0
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time   300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Root FWD 5        128.2   P2p
Gi0/2          Altn BLK 20    128.3   P2p

```

Obrázek 11: ALSW1 SPT 3/5

```

VLAN0303
  Spanning tree enabled protocol rstp
  Root ID    Priority    24879
            Address    5254.0016.6c37
            Cost        5
            Port        2 (GigabitEthernet0/1)
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    33071 (priority 32768 sys-id-ext 303)
            Address    5254.0005.5cd0
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost        Prio.Nbr Type
-----
Gi0/1                    Root FWD 5          128.2   P2p
Gi0/2                    Altn BLK 20       128.3   P2p

VLAN0998
  Spanning tree enabled protocol rstp
  Root ID    Priority    33766
            Address    5254.0005.5cd0
            This bridge is the root
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    33766 (priority 32768 sys-id-ext 998)
            Address    5254.0005.5cd0
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost        Prio.Nbr Type
-----
Gi1/1                    Desg FWD 4          128.6   P2p
Gi1/2                    Desg FWD 4          128.7   P2p
Gi1/3                    Desg FWD 4          128.8   P2p

```

Obrázek 12: ALSW1 SPT 4/5

```

VLAN0999
  Spanning tree enabled protocol rstp
  Root ID    Priority    33767
            Address    5254.0005.5cd0
            This bridge is the root
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    33767 (priority 32768 sys-id-ext 999)
            Address    5254.0005.5cd0
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost        Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4          128.2   P2p
Gi0/2                    Desg FWD 4          128.3   P2p

```

Obrázek 13: ALSW1 SPT 5/5

```

DLSW1(config)#do sh spanning-tree
VLAN0018
  Spanning tree enabled protocol rstp
  Root ID    Priority    32786
             Address     5254.0005.5cd0
             Cost        4
             Port        5 (GigabitEthernet1/0)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32786 (priority 32768 sys-id-ext 18)
             Address     5254.0016.6c37
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time   300 sec

Interface                Role Sts Cost      Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4         128.2   P2p
Gi1/0                    Root FWD 4         128.5   P2p
Po1                      Desg FWD 4         128.65  P2p

VLAN0101
  Spanning tree enabled protocol rstp
  Root ID    Priority    28773
             Address     5254.0016.6c37
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    28773 (priority 28672 sys-id-ext 101)
             Address     5254.0016.6c37
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time   300 sec

Interface                Role Sts Cost      Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4         128.2   P2p
Gi1/0                    Desg FWD 20        128.5   P2p
Po1                      Desg FWD 4         128.65  P2p

```

Obrázek 14: DLSW1 SPT 1/5

```

VLAN0102
Spanning tree enabled protocol rstp
Root ID    Priority    28774
           Address    5254.0016.6c37
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    28774 (priority 28672 sys-id-ext 102)
           Address    5254.0016.6c37
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.2   P2p
Gi1/0          Desg FWD 20       128.5   P2p
Po1            Desg FWD 4        128.65  P2p

VLAN0103
Spanning tree enabled protocol rstp
Root ID    Priority    28775
           Address    5254.0016.6c37
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    28775 (priority 28672 sys-id-ext 103)
           Address    5254.0016.6c37
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.2   P2p
Gi1/0          Desg FWD 20       128.5   P2p
Po1            Desg FWD 4        128.65  P2p

```

Obrázek 15: DLSW1 SPT 2/5



```

VLAN0301
Spanning tree enabled protocol rstp
Root ID    Priority    24877
           Address    5254.0016.6c37
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    24877 (priority 24576 sys-id-ext 301)
           Address    5254.0016.6c37
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.2   P2p
Gi1/0          Desg FWD 5        128.5   P2p
Po1            Desg FWD 4        128.65  P2p

```

```

VLAN0302
Spanning tree enabled protocol rstp
Root ID    Priority    24878
           Address    5254.0016.6c37
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    24878 (priority 24576 sys-id-ext 302)
           Address    5254.0016.6c37
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.2   P2p
Gi1/0          Desg FWD 5        128.5   P2p
Po1            Desg FWD 4        128.65  P2p

```

Obrázek 16: DLSW1 SPT 3/5

```

VLAN0303
Spanning tree enabled protocol rstp
Root ID    Priority    24879
           Address    5254.0016.6c37
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    24879 (priority 24576 sys-id-ext 303)
           Address    5254.0016.6c37
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/1          Desg FWD 4        128.2   P2p
Gi1/0          Desg FWD 5        128.5   P2p
Po1            Desg FWD 4        128.65  P2p

```

```

VLAN0998
Spanning tree enabled protocol rstp
Root ID    Priority    33766
           Address    5254.0016.6c37
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    33766 (priority 32768 sys-id-ext 998)
           Address    5254.0016.6c37
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec

Interface      Role Sts Cost      Prio.Nbr Type
-----
Gi0/0          Desg FWD 4        128.1   P2p

```

Obrázek 17: DLSW1 SPT 4/5

```
VLAN0999
Spanning tree enabled protocol rstp
Root ID    Priority    33767
           Address    5254.0005.5cd0
           Cost        4
           Port        5 (GigabitEthernet1/0)
           Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID   Priority    33767 (priority 32768 sys-id-ext 999)
           Address    5254.0016.6c37
           Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time   300 sec

Interface          Role Sts Cost        Prio.Nbr Type
-----
Gi0/1              Desg FWD 4          128.2   P2p
Gi1/0              Root FWD 4          128.5   P2p
Po1                Desg FWD 4          128.65  P2p
```

Obrázek 18: DLSW1 SPT 5/5

```
DLSW2(config)#do sh spanning-tree

VLAN0018
Spanning tree enabled protocol rstp
Root ID    Priority    32786
           Address    5254.0005.5cd0
           Cost        4
           Port        5 (GigabitEthernet1/0)
           Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID   Priority    32786 (priority 32768 sys-id-ext 18)
           Address    5254.001d.c647
           Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time   300 sec

Interface          Role Sts Cost        Prio.Nbr Type
-----
Gi0/1              Desg FWD 4          128.2   P2p
Gi1/0              Root FWD 4          128.5   P2p
Po1                Altn BLK 4          128.65  P2p

VLAN0101
Spanning tree enabled protocol rstp
Root ID    Priority    28773
           Address    5254.0016.6c37
           Cost        4
           Port        65 (Port-channel1)
           Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID   Priority    28773 (priority 28672 sys-id-ext 101)
           Address    5254.001d.c647
           Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time   300 sec

Interface          Role Sts Cost        Prio.Nbr Type
-----
Gi0/1              Desg FWD 4          128.2   P2p
Gi1/0              Desg FWD 5          128.5   P2p
Po1                Root FWD 4          128.65  P2p
```

Obrázek 19: DLSW2 SPT 1/5

```

VLAN0102
Spanning tree enabled protocol rstp
Root ID    Priority    28774
           Address    5254.0016.6c37
           Cost        4
           Port        65 (Port-channel1)
           Hello Time   2 sec   Max Age 20 sec   Forward Delay 15 sec

Bridge ID   Priority    28774 (priority 28672 sys-id-ext 102)
           Address    5254.001d.c647
           Hello Time   2 sec   Max Age 20 sec   Forward Delay 15 sec
           Aging Time   300 sec

Interface          Role Sts Cost      Prio.Nbr Type
-----
Gi0/1              Desg FWD 4         128.2   P2p
Gi1/0              Desg FWD 5         128.5   P2p
Po1                Root FWD 4         128.65  P2p

VLAN0103
Spanning tree enabled protocol rstp
Root ID    Priority    28775
           Address    5254.0016.6c37
           Cost        4
           Port        65 (Port-channel1)
           Hello Time   2 sec   Max Age 20 sec   Forward Delay 15 sec

Bridge ID   Priority    28775 (priority 28672 sys-id-ext 103)
           Address    5254.001d.c647
           Hello Time   2 sec   Max Age 20 sec   Forward Delay 15 sec
           Aging Time   300 sec

Interface          Role Sts Cost      Prio.Nbr Type
-----
Gi0/1              Desg FWD 4         128.2   P2p
Gi1/0              Desg FWD 5         128.5   P2p
Po1                Root FWD 4         128.65  P2p

```

Obrázek 20: DLSW2 SPT 2/5

```

VLAN0301
  Spanning tree enabled protocol rstp
  Root ID    Priority    24877
            Address    5254.0016.6c37
            Cost        4
            Port        65 (Port-channel1)
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    24877 (priority 24576 sys-id-ext 301)
            Address    5254.001d.c647
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost          Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4           128.2   P2p
Gi1/0                    Desg FWD 20          128.5   P2p
Po1                      Root FWD 4           128.65  P2p

```

```

VLAN0302
  Spanning tree enabled protocol rstp
  Root ID    Priority    24878
            Address    5254.0016.6c37
            Cost        4
            Port        65 (Port-channel1)
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    24878 (priority 24576 sys-id-ext 302)
            Address    5254.001d.c647
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost          Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4           128.2   P2p
Gi1/0                    Desg FWD 20          128.5   P2p
Po1                      Root FWD 4           128.65  P2p

```

Obrázek 21: DLSW2 SPT 3/5

```

VLAN0303
  Spanning tree enabled protocol rstp
  Root ID    Priority    24879
            Address    5254.0016.6c37
            Cost        4
            Port        65 (Port-channel1)
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    24879 (priority 24576 sys-id-ext 303)
            Address    5254.001d.c647
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost          Prio.Nbr Type
-----
Gi0/1                    Desg FWD 4           128.2   P2p
Gi1/0                    Desg FWD 20          128.5   P2p
Po1                      Root FWD 4           128.65  P2p

```

```

VLAN0998
  Spanning tree enabled protocol rstp
  Root ID    Priority    33766
            Address    5254.001d.c647
            This bridge is the root
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    33766 (priority 32768 sys-id-ext 998)
            Address    5254.001d.c647
            Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time   300 sec

Interface                Role Sts Cost          Prio.Nbr Type
-----
Gi0/0                    Desg FWD 4           128.1   P2p

```

Obrázek 22: DLSW2 SPT 4/5

```

VLAN0999
  Spanning tree enabled protocol rstp
    Root ID      Priority    33767
              Address      5254.0005.5cd0
              Cost         4
              Port         5 (GigabitEthernet1/0)
              Hello Time    2 sec  Max Age 20 sec  Forward Delay 15 sec

    Bridge ID     Priority    33767 (priority 32768 sys-id-ext 999)
              Address      5254.001d.c647
              Hello Time    2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time    300 sec

Interface      Role  Sts Cost      Prio.Nbr  Type
-----
Gi0/1          Desg FWD 4          128.2     P2p
Gi1/0          Root FWD 4          128.5     P2p
Po1            Altn BLK 4          128.65    P2p
  
```

Obrázek 23: DLSW2 SPT 5/5

## 4 Adresování

### 4.1 IPv4

Klient/server

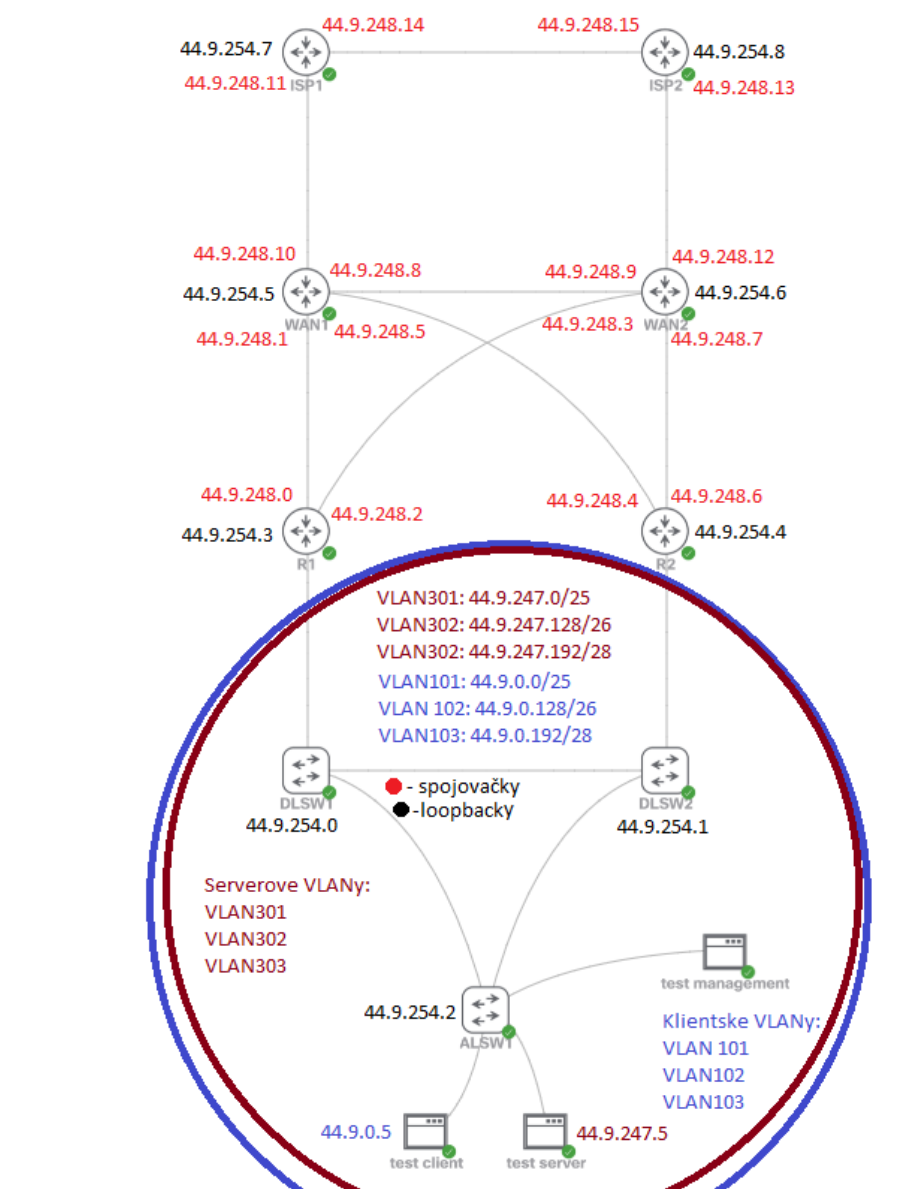
Name	Network address	Description
VLAN 101	44.9.0.0/25	Client VLAN 1
VLAN 102	44.9.0.128/26	Client VLAN 2
VLAN 103	44.9.0.192/28	Client VLAN 3
Client 1	44.9.1.0/25	First client subnet
...	...	...
Client 200	44.9.100.128/25	Last client subnet
...	...	...
Server 1	44.9.222.0/25	First server subnet
...	...	...
Server 50	44.9.246.128/25	Last server subnet
VLAN 301	44.9.247.0/25	Server VLAN 1
VLAN 302	44.9.247.128/26	Server VLAN 2
VLAN 303	44.9.247.192/28	Server VLAN 3

Global

Name	Network address	First address	Second address	Description
R1-WAN1	44.9.248.0/31	44.9.248.0	44.9.248.1	IC Link
DLSW1	44.9.254.0/32	44.9.254.0	-	Loopback01

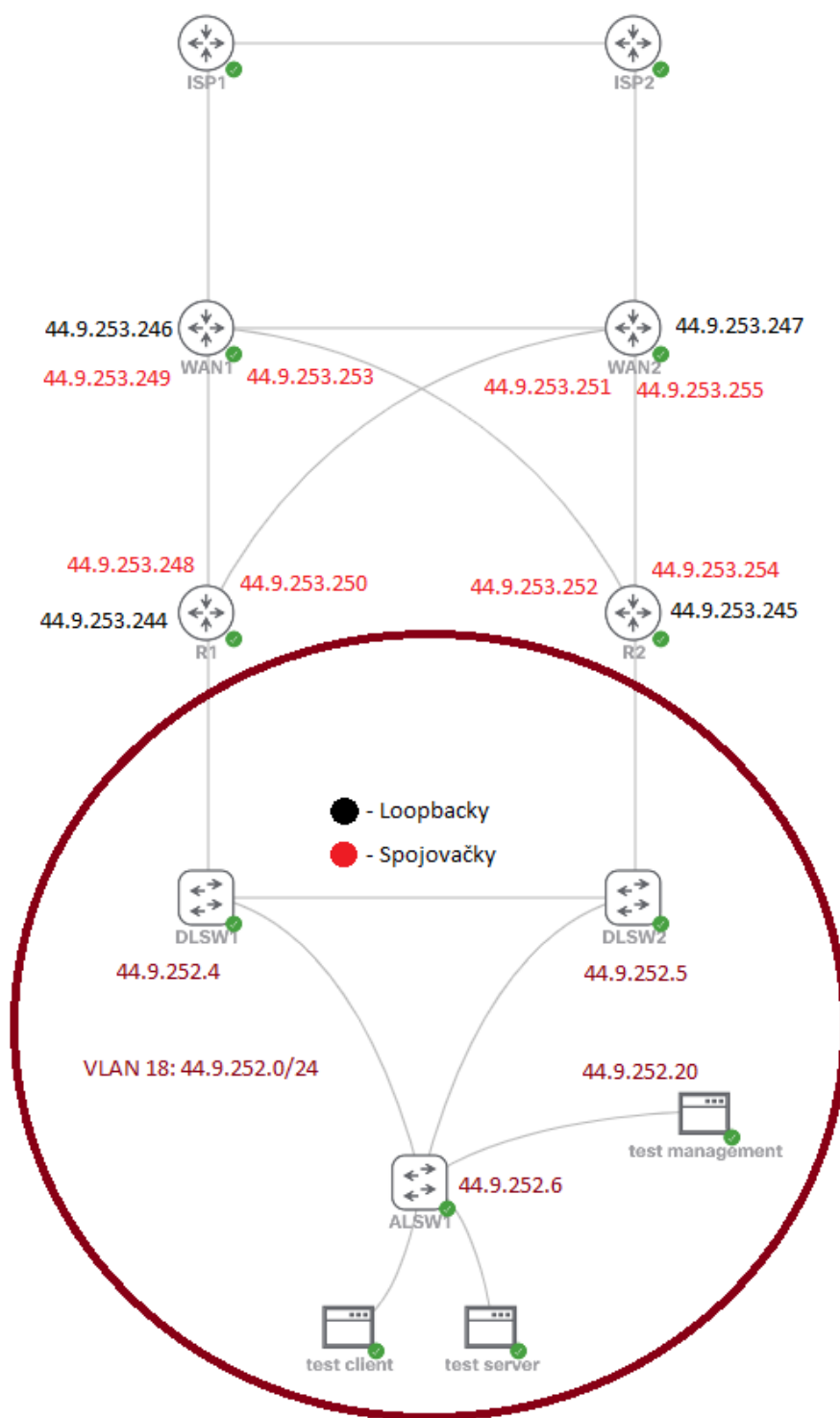
Management

Name	Network address	First address	Second address	Description
R1-WAN1	44.9.253.248/31	44.9.253.248	44.9.253.249	IC Link
R1-WAN2	44.9.253.250/31	44.9.253.250	44.9.253.251	IC Link
R2-WAN1	44.9.253.252/31	44.9.253.252	44.9.253.253	IC Link
R2-WAN2	44.9.253.254/31	44.9.253.254	44.9.253.255	IC Link
VRRP	44.9.252.0/24	44.9.252.1	-	R1 & R2 virtual
R1	44.9.252.0/24	44.9.252.2	-	Adress on interface
R2	44.9.252.0/24	44.9.252.3	-	Adress on interface
DLSW1	44.9.252.0/24	44.9.252.4	-	VLAN 18
DLSW2	44.9.252.0/24	44.9.252.5	-	VLAN 18
ALSW1	44.9.252.0/24	44.9.252.6	-	VLAN 18
TEST PC	44.9.252.0/24	44.9.252.20	-	VLAN 18
R1	44.9.253.244/32	44.9.253.244	-	Loopback1
R2	44.9.253.245/32	44.9.253.245	-	Loopback1
WAN1	44.9.253.246/32	44.9.253.246	-	Loopback1
WAN2	44.9.253.247/32	44.9.253.247	-	Loopback1



Obrázek 24: IPv4 addressing





Obrázek 25: IPv4 management addressing

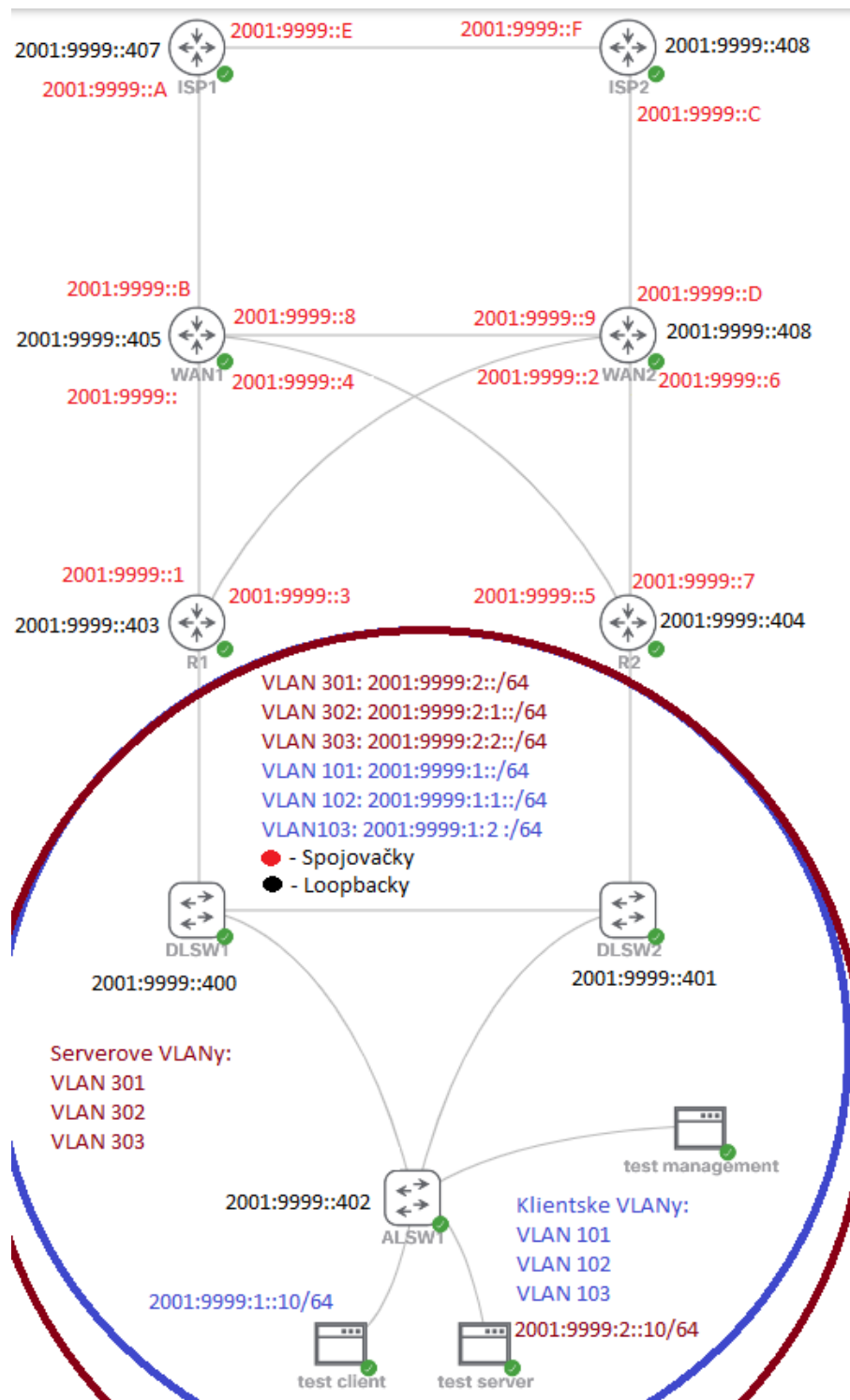
## 4.2 IPv6

Klient/server

Name	Network address	Description
VLAN 101	44.9.0.0/25	Client VLAN 1
VLAN 102	44.9.0.128/26	Client VLAN 2
VLAN 103	44.9.0.192/28	Client VLAN 3
Client 1	44.9.1.0/25	First client subnet
...	...	...
Client 200	44.9.100.128/25	Last client subnet
...	...	...
Server 1	44.9.222.0/25	First server subnet
...	...	...
Server 50	44.9.246.128/25	Last server subnet
VLAN 301	44.9.247.0/25	Server VLAN 1
VLAN 302	44.9.247.128/26	Server VLAN 2
VLAN 303	44.9.247.192/28	Server VLAN 3

#### Management

Name	Network address	First address	Second address	Description
R1-WAN1	44.9.253.248/31	44.9.253.248	44.9.253.249	IC Link
R1-WAN2	44.9.253.250/31	44.9.253.250	44.9.253.251	IC Link
R2-WAN1	44.9.253.252/31	44.9.253.252	44.9.253.253	IC Link
R2-WAN2	44.9.253.254/31	44.9.253.254	44.9.253.255	IC Link
VRRP	44.9.252.0/24	44.9.252.1	-	R1 & R2 virtual
R1	44.9.252.0/24	44.9.252.2	-	Adress on interface
R2	44.9.252.0/24	44.9.252.3	-	Adress on interface
DLSW1	44.9.252.0/24	44.9.252.4	-	VLAN 18
DLSW2	44.9.252.0/24	44.9.252.5	-	VLAN 18
ALSW1	44.9.252.0/24	44.9.252.6	-	VLAN 18
TEST PC	44.9.252.0/24	44.9.252.20	-	VLAN 18
R1	44.9.253.244/32	44.9.253.244	-	Loopback1
R2	44.9.253.245/32	44.9.253.245	-	Loopback1
WAN1	44.9.253.246/32	44.9.253.246	-	Loopback1
WAN2	44.9.253.247/32	44.9.253.247	-	Loopback1



Obrázek 26: IPv6 addressing

### 4.3 Rekonvergence

V IGP je primárně preferována cesta přes WAN1, při výpadku cesty trvá cca 35 s než dojde k převzetí jinou cestou

```
localhost:~$ ping 1.0.0.1 -w 50
PING 1.0.0.1 (1.0.0.1): 56 data bytes
64 bytes from 1.0.0.1: seq=0 ttl=42 time=9.225 ms
64 bytes from 1.0.0.1: seq=1 ttl=42 time=8.573 ms
64 bytes from 1.0.0.1: seq=2 ttl=42 time=9.392 ms
64 bytes from 1.0.0.1: seq=3 ttl=42 time=11.693 ms
64 bytes from 1.0.0.1: seq=4 ttl=42 time=8.659 ms
64 bytes from 1.0.0.1: seq=41 ttl=42 time=12.754 ms
64 bytes from 1.0.0.1: seq=42 ttl=42 time=8.459 ms
64 bytes from 1.0.0.1: seq=43 ttl=42 time=15.174 ms
64 bytes from 1.0.0.1: seq=44 ttl=42 time=10.563 ms
64 bytes from 1.0.0.1: seq=45 ttl=42 time=9.732 ms
64 bytes from 1.0.0.1: seq=46 ttl=42 time=9.518 ms
64 bytes from 1.0.0.1: seq=47 ttl=42 time=14.431 ms
64 bytes from 1.0.0.1: seq=48 ttl=42 time=11.416 ms
64 bytes from 1.0.0.1: seq=49 ttl=42 time=9.151 ms
```

Obrázek 27: IPv4 rekonvergence

## 5 FHRP

### 5.1 Implementace

do sh standby br

```
R1(config-subif)#do sh standby br
P indicates configured to preempt.
|
```

Interface	Grp	Pri	P	State	Active	Standby	Virtual IP
Gi0/1.101	11	120	P	Standby	FE80::5054:FF:FE17:C2F3	local	FE80::5:73FF:FEA0:B
Gi0/1.101	101	120	P	Standby	44.9.0.3	local	44.9.0.1
Gi0/1.102	12	120	P	Standby	FE80::5054:FF:FE17:C2F3	local	FE80::5:73FF:FEA0:C
Gi0/1.102	102	120	P	Standby	44.9.0.131	local	44.9.0.129
Gi0/1.103	13	120	P	Standby	FE80::5054:FF:FE17:C2F3	local	FE80::5:73FF:FEA0:D
Gi0/1.103	103	120	P	Standby	44.9.0.195	local	44.9.0.193
Gi0/1.301	1	150	P	Active	local	44.9.247.3	44.9.247.1
Gi0/1.301	21	150	P	Active	local	FE80::5054:FF:FE17:C2F3	FE80::5:73FF:FEA0:15
Gi0/1.302	2	150	P	Active	local	44.9.247.131	44.9.247.129
Gi0/1.302	22	150	P	Active	local	FE80::5054:FF:FE17:C2F3	FE80::5:73FF:FEA0:16
Gi0/1.303	3	150	P	Active	local	44.9.247.195	44.9.247.193
Gi0/1.303	23	150	P	Active	local	FE80::5054:FF:FE17:C2F3	FE80::5:73FF:FEA0:17

Obrázek 28: R1 FHRP implementace

```
R2(config-subif)#do sh standby br
P indicates configured to preempt.
|
```

Interface	Grp	Pri	P	State	Active	Standby	Virtual IP
Gi0/1.101	11	120	P	Active	local	FE80::5054:FF:FE06:69A1	FE80::5:73FF:FEA0:B
Gi0/1.101	101	150	P	Active	local	44.9.0.2	44.9.0.1
Gi0/1.102	12	150	P	Active	local	FE80::5054:FF:FE06:69A1	FE80::5:73FF:FEA0:C
Gi0/1.102	102	150	P	Active	local	44.9.0.130	44.9.0.129
Gi0/1.103	13	150	P	Active	local	FE80::5054:FF:FE06:69A1	FE80::5:73FF:FEA0:D
Gi0/1.103	103	150	P	Active	local	44.9.0.194	44.9.0.193
Gi0/1.301	1	120	P	Standby	44.9.247.2	local	44.9.247.1
Gi0/1.301	21	120	P	Standby	FE80::5054:FF:FE06:69A1	local	FE80::5:73FF:FEA0:15
Gi0/1.302	2	120	P	Standby	44.9.247.130	local	44.9.247.129
Gi0/1.302	22	120	P	Standby	FE80::5054:FF:FE06:69A1	local	FE80::5:73FF:FEA0:16
Gi0/1.303	3	120	P	Standby	44.9.247.194	local	44.9.247.193
Gi0/1.303	23	120	P	Standby	FE80::5054:FF:FE06:69A1	local	FE80::5:73FF:FEA0:17

Obrázek 29: R2 FHRP implementace

### 5.2 Tracking

do sh standby

```

R1(config-if)#do sh standby
GigabitEthernet0/1.101 - Group 11 (version 2)
  State is Standby
    5 state changes, last state change 00:05:20
    Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:B (impl auto EUI64)
    Virtual IPv6 address 2001:9999:1::/64
    Active virtual MAC address is 0005.73a0.000b
    Local virtual MAC address is 0005.73a0.000b (v2 IPv6 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.288 secs
    Preemption enabled
    Active router is FE80::5054:FF:FE17:C2F3, priority 120 (expires in 9.184 sec)
    MAC address is 5254.0017.c2f3
    Standby router is local
    Priority 120 (configured 120)
    Group name is "hsrp-Gi0/1.101-11" (default)
GigabitEthernet0/1.101 - Group 101 (version 2)
  State is Standby
    6 state changes, last state change 00:05:19
    Virtual IP address is 44.9.0.1
    Active virtual MAC address is 0000.0c9f.f065
    Local virtual MAC address is 0000.0c9f.f065 (v2 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.192 secs
    Preemption enabled
    Active router is 44.9.0.3, priority 150 (expires in 8.848 sec)
    MAC address is 5254.0017.c2f3
    Standby router is local
    Priority 120 (configured 120)
    Group name is "hsrp-Gi0/1.101-101" (default)

```

Obrázek 30: R1 FHRP detail 1/6

```

GigabitEthernet0/1.102 - Group 12 (version 2)
  State is Standby
    6 state changes, last state change 00:05:20
    Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:C (impl auto EUI64)
    Virtual IPv6 address 2001:9999:1:1::/64
    Active virtual MAC address is 0005.73a0.000c
    Local virtual MAC address is 0005.73a0.000c (v2 IPv6 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.448 secs
    Preemption enabled
    Active router is FE80::5054:FF:FE17:C2F3, priority 150 (expires in 10.000 sec)
    MAC address is 5254.0017.c2f3
    Standby router is local
    Priority 120 (configured 120)
    Group name is "hsrp-Gi0/1.102-12" (default)
GigabitEthernet0/1.102 - Group 102 (version 2)
  State is Standby
    6 state changes, last state change 00:05:20
    Virtual IP address is 44.9.0.129
    Active virtual MAC address is 0000.0c9f.f066
    Local virtual MAC address is 0000.0c9f.f066 (v2 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.160 secs
    Preemption enabled
    Active router is 44.9.0.131, priority 150 (expires in 7.776 sec)
    MAC address is 5254.0017.c2f3
    Standby router is local
    Priority 120 (configured 120)
    Group name is "hsrp-Gi0/1.102-102" (default)

```

Obrázek 31: R1 FHRP detail 2/6

```

GigabitEthernet0/1.103 - Group 13 (version 2)
  State is Standby
    3 state changes, last state change 00:05:18
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:D (impl auto EUI64)
    Virtual IPv6 address 2001:9999:1:2::/64
  Active virtual MAC address is 0005.73a0.000d
    Local virtual MAC address is 0005.73a0.000d (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.392 secs
  Preemption enabled
  Active router is FE80::5054:FF:FE17:C2F3, priority 150 (expires in 8.448 sec)
    MAC address is 5254.0017.c2f3
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.103-13" (default)
GigabitEthernet0/1.103 - Group 103 (version 2)
  State is Standby
    3 state changes, last state change 00:05:21
  Virtual IP address is 44.9.0.193
  Active virtual MAC address is 0000.0c9f.f067
    Local virtual MAC address is 0000.0c9f.f067 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.864 secs
  Preemption enabled
  Active router is 44.9.0.195, priority 150 (expires in 9.760 sec)
    MAC address is 5254.0017.c2f3
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.103-103" (default)

```

Obrázek 32: R1 FHRP detail 3/6

```

GigabitEthernet0/1.301 - Group 1 (version 2)
  State is Active
    4 state changes, last state change 00:05:41
  Virtual IP address is 44.9.247.1
  Active virtual MAC address is 0000.0c9f.f001
    Local virtual MAC address is 0000.0c9f.f001 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.864 secs
  Preemption enabled
  Active router is local
  Standby router is 44.9.247.3, priority 120 (expires in 10.848 sec)
  Priority 150 (configured 150)
    Track object 301 state Up decrement 30
  Group name is "hsrp-Gi0/1.301-1" (default)
GigabitEthernet0/1.301 - Group 21 (version 2)
  State is Active
    4 state changes, last state change 00:05:41
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:15 (impl auto EUI64)
    Virtual IPv6 address 2001:9999:2::/64
  Active virtual MAC address is 0005.73a0.0015
    Local virtual MAC address is 0005.73a0.0015 (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.672 secs
  Preemption enabled
  Active router is local
  Standby router is FE80::5054:FF:FE17:C2F3, priority 120 (expires in 10.880 sec)
  Priority 150 (configured 150)
    Track object 31 state Up decrement 30
  Group name is "hsrp-Gi0/1.301-21" (default)

```

Obrázek 33: R1 FHRP detail 4/6

```

GigabitEthernet0/1.302 - Group 2 (version 2)
  State is Active
    4 state changes, last state change 00:05:42
  Virtual IP address is 44.9.247.129
  Active virtual MAC address is 0000.0c9f.f002
    Local virtual MAC address is 0000.0c9f.f002 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.040 secs
  Preemption enabled
  Active router is local
  Standby router is 44.9.247.131, priority 120 (expires in 11.360 sec)
  Priority 150 (configured 150)
    Track object 302 state Up decrement 30
  Group name is "hsrp-Gi0/1.302-2" (default)
GigabitEthernet0/1.302 - Group 22 (version 2)
  State is Active
    4 state changes, last state change 00:05:41
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:16 (impl auto EUI64)
  Virtual IPv6 address 2001:9999:2:1::/64
  Active virtual MAC address is 0005.73a0.0016
    Local virtual MAC address is 0005.73a0.0016 (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.128 secs
  Preemption enabled
  Active router is local
  Standby router is FE80::5054:FF:FE17:C2F3, priority 120 (expires in 8.000 sec)
  Priority 150 (configured 150)
    Track object 32 state Up decrement 30
  Group name is "hsrp-Gi0/1.302-22" (default)

```

Obrázek 34: R1 FHRP detail 5/6

```

GigabitEthernet0/1.303 - Group 3 (version 2)
  State is Active
    4 state changes, last state change 00:05:42
  Virtual IP address is 44.9.247.193
  Active virtual MAC address is 0000.0c9f.f003
    Local virtual MAC address is 0000.0c9f.f003 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.136 secs
  Preemption enabled
  Active router is local
  Standby router is 44.9.247.195, priority 120 (expires in 9.680 sec)
  Priority 150 (configured 150)
    Track object 303 state Up decrement 30
  Group name is "hsrp-Gi0/1.303-3" (default)
GigabitEthernet0/1.303 - Group 23 (version 2)
  State is Active
    4 state changes, last state change 00:05:41
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:17 (impl auto EUI64)
  Virtual IPv6 address 2001:9999:2:2::/64
  Active virtual MAC address is 0005.73a0.0017
    Local virtual MAC address is 0005.73a0.0017 (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.464 secs
  Preemption enabled
  Active router is local
  Standby router is FE80::5054:FF:FE17:C2F3, priority 120 (expires in 10.288 sec)
  Priority 150 (configured 150)
    Track object 33 state Up decrement 30
  Group name is "hsrp-Gi0/1.303-23" (default)

```

Obrázek 35: R1 FHRP detail 6/6



```

R2(config-if)#do sh standby
GigabitEthernet0/1.101 - Group 11 (version 2)
  State is Active
    2 state changes, last state change 01:54:45
    Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:B (impl auto EUI64)
    Virtual IPv6 address 2001:9999:1::/64
    Active virtual MAC address is 0005.73a0.000b
    Local virtual MAC address is 0005.73a0.000b (v2 IPv6 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.112 secs
  Preemption enabled
  Active router is local
  Standby router is FE80::5054:FF:FE06:69A1, priority 120 (expires in 8.688 sec)
  Priority 120 (configured 120)
    Track object 11 state Up decrement 30
  Group name is "hsrp-Gi0/1.101-11" (default)
GigabitEthernet0/1.101 - Group 101 (version 2)
  State is Active
    1 state change, last state change 01:55:07
    Virtual IP address is 44.9.0.1
    Active virtual MAC address is 0000.0c9f.f065
    Local virtual MAC address is 0000.0c9f.f065 (v2 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.288 secs
  Preemption enabled
  Active router is local
  Standby router is 44.9.0.2, priority 120 (expires in 8.816 sec)
  Priority 150 (configured 150)
    Track object 101 state Up decrement 30
  Group name is "hsrp-Gi0/1.101-101" (default)

```

Obrázek 36: R2 FHRP detail 1/6

```

GigabitEthernet0/1.102 - Group 12 (version 2)
  State is Active
    1 state change, last state change 01:55:07
    Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:C (impl auto EUI64)
    Virtual IPv6 address 2001:9999:1:1::/64
    Active virtual MAC address is 0005.73a0.000c
    Local virtual MAC address is 0005.73a0.000c (v2 IPv6 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.576 secs
  Preemption enabled
  Active router is local
  Standby router is FE80::5054:FF:FE06:69A1, priority 120 (expires in 9.600 sec)
  Priority 150 (configured 150)
    Track object 12 state Up decrement 30
  Group name is "hsrp-Gi0/1.102-12" (default)
GigabitEthernet0/1.102 - Group 102 (version 2)
  State is Active
    1 state change, last state change 01:55:06
    Virtual IP address is 44.9.0.129
    Active virtual MAC address is 0000.0c9f.f066
    Local virtual MAC address is 0000.0c9f.f066 (v2 default)
    Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.192 secs
  Preemption enabled
  Active router is local
  Standby router is 44.9.0.130, priority 120 (expires in 8.176 sec)
  Priority 150 (configured 150)
    Track object 102 state Up decrement 30
  Group name is "hsrp-Gi0/1.102-102" (default)

```

Obrázek 37: R2 FHRP detail 2/6

```
GigabitEthernet0/1.103 - Group 13 (version 2)
  State is Active
    2 state changes, last state change 01:52:38
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:D (impl auto EUI64)
  Virtual IPv6 address 2001:9999:1:2::/64
  Active virtual MAC address is 0005.73a0.000d
    Local virtual MAC address is 0005.73a0.000d (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.528 secs
  Preemption enabled
  Active router is local
  Standby router is FE80::5054:FF:FE06:69A1, priority 120 (expires in 10.608 sec)
  Priority 150 (configured 150)
    Track object 13 state Up decrement 30
  Group name is "hsrp-Gi0/1.103-13" (default)
GigabitEthernet0/1.103 - Group 103 (version 2)
  State is Active
    2 state changes, last state change 01:52:48
  Virtual IP address is 44.9.0.193
  Active virtual MAC address is 0000.0c9f.f067
    Local virtual MAC address is 0000.0c9f.f067 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.688 secs
  Preemption enabled
  Active router is local
  Standby router is 44.9.0.194, priority 120 (expires in 9.840 sec)
  Priority 150 (configured 150)
    Track object 103 state Up decrement 30
  Group name is "hsrp-Gi0/1.103-103" (default)
```

Obrázek 38: R2 FHRP detail 3/6

```
GigabitEthernet0/1.301 - Group 1 (version 2)
  State is Standby
    4 state changes, last state change 00:17:50
  Virtual IP address is 44.9.247.1
  Active virtual MAC address is 0000.0c9f.f001
    Local virtual MAC address is 0000.0c9f.f001 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.824 secs
  Preemption enabled
  Active router is 44.9.247.2, priority 150 (expires in 10.032 sec)
    MAC address is 5254.0006.69a1
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.301-1" (default)
GigabitEthernet0/1.301 - Group 21 (version 2)
  State is Standby
    4 state changes, last state change 00:17:50
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:15 (impl auto EUI64)
  Virtual IPv6 address 2001:9999:2::/64
  Active virtual MAC address is 0005.73a0.0015
    Local virtual MAC address is 0005.73a0.0015 (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.544 secs
  Preemption enabled
  Active router is FE80::5054:FF:FE06:69A1, priority 150 (expires in 7.680 sec)
    MAC address is 5254.0006.69a1
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.301-21" (default)
```

Obrázek 39: R2 FHRP detail 4/6

```
GigabitEthernet0/1.302 - Group 2 (version 2)
  State is Standby
    4 state changes, last state change 00:17:50
  Virtual IP address is 44.9.247.129
  Active virtual MAC address is 0000.0c9f.f002
    Local virtual MAC address is 0000.0c9f.f002 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.136 secs
  Preemption enabled
  Active router is 44.9.247.130, priority 150 (expires in 10.944 sec)
    MAC address is 5254.0006.69a1
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.302-2" (default)
GigabitEthernet0/1.302 - Group 22 (version 2)
  State is Standby
    4 state changes, last state change 00:17:50
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:16 (impl auto EUI64)
  Virtual IPv6 address 2001:9999:2:1::/64
  Active virtual MAC address is 0005.73a0.0016
    Local virtual MAC address is 0005.73a0.0016 (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.272 secs
  Preemption enabled
  Active router is FE80::5054:FF:FE06:69A1, priority 150 (expires in 8.288 sec)
    MAC address is 5254.0006.69a1
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.302-22" (default)
```

Obrázek 40: R2 FHRP detail 5/6

```
GigabitEthernet0/1.303 - Group 3 (version 2)
  State is Standby
    4 state changes, last state change 00:17:50
  Virtual IP address is 44.9.247.193
  Active virtual MAC address is 0000.0c9f.f003
    Local virtual MAC address is 0000.0c9f.f003 (v2 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.304 secs
  Preemption enabled
  Active router is 44.9.247.194, priority 150 (expires in 8.192 sec)
    MAC address is 5254.0006.69a1
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.303-3" (default)
GigabitEthernet0/1.303 - Group 23 (version 2)
  State is Standby
    4 state changes, last state change 00:17:48
  Link-Local Virtual IPv6 address is FE80::5:73FF:FEA0:17 (impl auto EUI64)
  Virtual IPv6 address 2001:9999:2:2::/64
  Active virtual MAC address is 0005.73a0.0017
    Local virtual MAC address is 0005.73a0.0017 (v2 IPv6 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.552 secs
  Preemption enabled
  Active router is FE80::5054:FF:FE06:69A1, priority 150 (expires in 8.000 sec)
    MAC address is 5254.0006.69a1
  Standby router is local
  Priority 120 (configured 120)
  Group name is "hsrp-Gi0/1.303-23" (default)
```

Obrázek 41: R2 FHRP detail 6/6

do sh track

```

R1(config-if)#do sh track
Track 31
  IPv6 route 2001:9999:2::/64 reachability
  Reachability is Up (connected)
    1 change, last change 01:50:00
  First-hop interface is GigabitEthernet0/1.301
  Tracked by:
    HSRP GigabitEthernet0/1.301 21
Track 32
  IPv6 route 2001:9999:2:1::/64 reachability
  Reachability is Up (connected)
    1 change, last change 01:50:00
  First-hop interface is GigabitEthernet0/1.302
  Tracked by:
    HSRP GigabitEthernet0/1.302 22
Track 33
  IPv6 route 2001:9999:2:2::/64 reachability
  Reachability is Up (connected)
    1 change, last change 01:50:00
  First-hop interface is GigabitEthernet0/1.303
  Tracked by:
    HSRP GigabitEthernet0/1.303 23
Track 301
  IP route 44.9.247.0 255.255.255.128 reachability
  Reachability is Up (connected)
    2 changes, last change 02:19:48
  First-hop interface is GigabitEthernet0/1.301
  Tracked by:
    HSRP GigabitEthernet0/1.301 1
Track 302
  IP route 44.9.247.128 255.255.255.192 reachability
  Reachability is Up (connected)
    2 changes, last change 02:19:48
  First-hop interface is GigabitEthernet0/1.302
  Tracked by:
    HSRP GigabitEthernet0/1.302 2
Track 303
  IP route 44.9.247.192 255.255.255.240 reachability
  Reachability is Up (connected)
    2 changes, last change 02:19:48
  First-hop interface is GigabitEthernet0/1.303
  Tracked by:
    HSRP GigabitEthernet0/1.303 3

```

Obrázek 42: R1 Tracking

```

R2(config-if)#do sh track
Track 11
  IPv6 route 2001:9999:1::/64 reachability
  Reachability is Up (connected)
    1 change, last change 01:59:35
  First-hop interface is GigabitEthernet0/1.101
  Tracked by:
    HSRP GigabitEthernet0/1.101 11
Track 12
  IPv6 route 2001:9999:1:1::/64 reachability
  Reachability is Up (connected)
    1 change, last change 01:59:35
  First-hop interface is GigabitEthernet0/1.102
  Tracked by:
    HSRP GigabitEthernet0/1.102 12
Track 13
  IPv6 route 2001:9999:1:2::/64 reachability
  Reachability is Up (connected)
    1 change, last change 01:59:35
  First-hop interface is GigabitEthernet0/1.103
  Tracked by:
    HSRP GigabitEthernet0/1.103 13
Track 101
  IP route 44.9.0.0 255.255.255.128 reachability
  Reachability is Up (connected)
    2 changes, last change 02:28:14
  First-hop interface is GigabitEthernet0/1.101
  Tracked by:
    HSRP GigabitEthernet0/1.101 101
Track 102
  IP route 44.9.0.128 255.255.255.192 reachability
  Reachability is Up (connected)
    2 changes, last change 02:28:14
  First-hop interface is GigabitEthernet0/1.102
  Tracked by:
    HSRP GigabitEthernet0/1.102 102
Track 103
  IP route 44.9.0.192 255.255.255.240 reachability
  Reachability is Up (connected)
    2 changes, last change 02:28:14
  First-hop interface is GigabitEthernet0/1.103
  Tracked by:
    HSRP GigabitEthernet0/1.103 103

```

Obrázek 43: R2 Tracking

## 6 BGP

```
do sh ip bgp
do sh bgp ipv6
prefixy
```

## **7 Management**

### **7.1 IPv4 VRRP**

## 8 IGP

do sh ip int br

```
ISP2(config)#do sh ip int br
Interface                IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
GigabitEthernet0/1       44.9.248.15     YES manual  up              up
GigabitEthernet0/2       44.9.248.13     YES manual  up              up
GigabitEthernet0/3       unassigned      YES unset  administratively down  down
Loopback0                 44.9.254.8     YES manual  up              up
Loopback100              2.0.0.1         YES manual  up              up
```

Obrázek 44: ISP1 IPv4 interface brief

```
ISP1(config)#do sh ip int br
Interface                IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
GigabitEthernet0/1       44.9.248.14     YES manual  up              up
GigabitEthernet0/2       44.9.248.11     YES manual  up              up
GigabitEthernet0/3       unassigned      YES unset  administratively down  down
Loopback0                 44.9.254.7     YES manual  up              up
Loopback100              1.0.0.1         YES manual  up              up
```

Obrázek 45: ISP2 IPv4 interface brief

```
WAN1(config-if)#do sh ip int br
Interface                IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
GigabitEthernet0/1       44.9.248.8       YES manual  up              up
GigabitEthernet0/2       44.9.248.10     YES manual  up              up
GigabitEthernet0/3       unassigned      YES unset  up              up
GigabitEthernet0/3.9     44.9.248.1       YES manual  up              up
GigabitEthernet0/3.91    44.9.253.249     YES manual  up              up
GigabitEthernet0/4       unassigned      YES unset  up              up
GigabitEthernet0/4.9     44.9.248.5       YES manual  up              up
GigabitEthernet0/4.91    44.9.253.253     YES manual  up              up
Loopback0                 44.9.254.5     YES manual  up              up
Loopback1                 44.9.253.246   YES manual  up              up
```

Obrázek 46: WAN1 IPv4 interface brief

```
WAN2(config-router)#do sh ip int br
Interface                IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
GigabitEthernet0/1       44.9.248.9       YES manual  up              up
GigabitEthernet0/2       44.9.248.12     YES manual  up              up
GigabitEthernet0/3       unassigned      YES unset  up              up
GigabitEthernet0/3.9     44.9.248.7       YES manual  up              up
GigabitEthernet0/3.91    44.9.253.255     YES manual  up              up
GigabitEthernet0/4       unassigned      YES unset  up              up
GigabitEthernet0/4.9     44.9.248.3       YES manual  up              up
GigabitEthernet0/4.91    44.9.253.251     YES manual  up              up
Loopback0                 44.9.254.6     YES manual  up              up
Loopback1                 44.9.253.247   YES manual  up              up
```

Obrázek 47: WAN2 IPv4 interface brief



```
R1(config)#do sh ip int br
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	up	up
GigabitEthernet0/0.9	unassigned	YES	manual	deleted	down
GigabitEthernet0/1	unassigned	YES	unset	up	up
GigabitEthernet0/1.18	44.9.252.2	YES	manual	up	up
GigabitEthernet0/1.101	44.9.0.2	YES	manual	up	up
GigabitEthernet0/1.102	44.9.0.130	YES	manual	up	up
GigabitEthernet0/1.103	44.9.0.194	YES	manual	up	up
GigabitEthernet0/1.301	44.9.247.2	YES	manual	up	up
GigabitEthernet0/1.302	44.9.247.130	YES	manual	up	up
GigabitEthernet0/1.303	44.9.247.194	YES	manual	up	up
GigabitEthernet0/2	unassigned	YES	unset	up	up
GigabitEthernet0/2.9	44.9.248.2	YES	manual	up	up
GigabitEthernet0/2.91	44.9.253.250	YES	manual	up	up
GigabitEthernet0/3	unassigned	YES	unset	up	up
GigabitEthernet0/3.9	44.9.248.0	YES	manual	up	up
GigabitEthernet0/3.91	44.9.253.248	YES	manual	up	up
Loopback0	44.9.254.3	YES	manual	up	up
Loopback1	44.9.253.244	YES	manual	up	up

Obrázek 48: R1 IPv4 interface brief

```
R2(config)#do sh ip int br
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	up	up
GigabitEthernet0/0.9	unassigned	YES	manual	deleted	down
GigabitEthernet0/1	unassigned	YES	unset	up	up
GigabitEthernet0/1.18	44.9.252.3	YES	manual	up	up
GigabitEthernet0/1.101	44.9.0.3	YES	manual	up	up
GigabitEthernet0/1.102	44.9.0.131	YES	manual	up	up
GigabitEthernet0/1.103	44.9.0.195	YES	manual	up	up
GigabitEthernet0/1.301	44.9.247.3	YES	manual	up	up
GigabitEthernet0/1.302	44.9.247.131	YES	manual	up	up
GigabitEthernet0/1.303	44.9.247.195	YES	manual	up	up
GigabitEthernet0/2	unassigned	YES	unset	up	up
GigabitEthernet0/2.9	44.9.248.4	YES	manual	up	up
GigabitEthernet0/2.91	44.9.253.252	YES	manual	up	up
GigabitEthernet0/3	unassigned	YES	unset	up	up
GigabitEthernet0/3.9	44.9.248.6	YES	manual	up	up
GigabitEthernet0/3.91	44.9.253.254	YES	manual	up	up
Loopback0	44.9.254.4	YES	manual	up	up
Loopback1	44.9.253.245	YES	manual	up	up

Obrázek 49: R2 IPv4 interface brief

```
DLSW1(config)#do sh ip int br
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	up	up
GigabitEthernet0/1	unassigned	YES	unset	up	up
GigabitEthernet0/2	unassigned	YES	unset	up	up
GigabitEthernet0/3	unassigned	YES	unset	up	down
GigabitEthernet1/0	unassigned	YES	unset	up	up
Loopback0	44.9.254.0	YES	manual	up	up
Port-channel1	unassigned	YES	unset	up	up
Vlan18	44.9.252.4	YES	manual	up	up

Obrázek 50: DLSW1 IPv4 interface brief

```
DLSW2(config)#do sh ip int br
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	unassigned	YES	unset	up	up
GigabitEthernet0/1	unassigned	YES	unset	up	up
GigabitEthernet0/2	unassigned	YES	unset	up	up
GigabitEthernet0/3	unassigned	YES	unset	up	down
GigabitEthernet1/0	unassigned	YES	unset	up	up
Loopback0	44.9.254.1	YES	manual	up	up
Port-channel1	unassigned	YES	unset	up	up
Vlan18	44.9.252.5	YES	manual	up	up

Obrázek 51: DLSW2 IPv4 interface brief

```

ALSW1(config-if)#do sh ip int br
Interface          IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0 unassigned      YES unset  up          up
GigabitEthernet0/1 unassigned      YES unset  up          up
GigabitEthernet0/2 unassigned      YES unset  up          up
GigabitEthernet0/3 unassigned      YES unset  up          up
GigabitEthernet1/0 unassigned      YES unset  up          up
GigabitEthernet1/1 unassigned      YES unset  up          up
GigabitEthernet1/2 unassigned      YES unset  up          up
GigabitEthernet1/3 unassigned      YES unset  up          up
Loopback0          44.9.254.2     YES manual up          up
Vlan18             44.9.252.6     YES manual up          up
Vlan101            44.9.0.126     YES manual up          up
Vlan102            44.9.0.190     YES manual up          up
Vlan103            44.9.0.206     YES manual up          up
Vlan301            44.9.247.126   YES manual up          up
Vlan302            44.9.247.190   YES manual up          up
Vlan303            44.9.247.206   YES manual up          up

```

Obrázek 52: ALSW1 IPv4 interface brief

do sh ipv6 int br

```

ISP1(config)#do sh ipv6 int br
GigabitEthernet0/0    [administratively down/down]
    unassigned
GigabitEthernet0/1    [up/up]
    FE80::5054:FF:FE15:C3EB
    2001:9999::E
GigabitEthernet0/2    [up/up]
    FE80::5054:FF:FE14:A49F
    2001:9999::A
GigabitEthernet0/3    [administratively down/down]
    unassigned
Loopback0             [up/up]
    FE80::5054:FF:FE09:3F75
    2001:9999::407
Loopback100           [up/up]
    FE80::5054:FF:FE09:3F75
    2001:9999:1000::1

```

Obrázek 53: ISP1 IPv6 interface brief

```
ISP2(config)#do sh ipv6 int br
GigabitEthernet0/0      [administratively down/down]
                        unassigned
GigabitEthernet0/1      [up/up]
                        FE80::5054:FF:FE03:212C
                        2001:9999::F
GigabitEthernet0/2      [up/up]
                        FE80::5054:FF:FE06:8F9B
                        2001:9999::C
GigabitEthernet0/3      [administratively down/down]
                        unassigned
Loopback0               [up/up]
                        FE80::5054:FF:FE10:E291
                        2001:9999::408
Loopback100             [up/up]
                        FE80::5054:FF:FE10:E291
                        2001:9999:2000::1
```

Obrázek 54: ISP2 IPv6 interface brief

```
WAN1(config)#do sh ipv6 int br
GigabitEthernet0/0      [administratively down/down]
                        unassigned
GigabitEthernet0/1      [up/up]
                        FE80::5054:FF:FE1B:E376
                        2001:9999::8
GigabitEthernet0/2      [up/up]
                        FE80::5054:FF:FE1B:4A54
                        2001:9999::B
GigabitEthernet0/3      [up/up]
                        unassigned
GigabitEthernet0/3.9    [up/up]
                        FE80::5054:FF:FE0A:6D0E
                        2001:9999::
GigabitEthernet0/3.91   [up/up]
                        unassigned
GigabitEthernet0/4      [up/up]
                        unassigned
GigabitEthernet0/4.9    [up/up]
                        FE80::5054:FF:FE13:CC01
                        2001:9999::4
GigabitEthernet0/4.91   [up/up]
                        unassigned
Loopback0               [up/up]
                        FE80::5054:FF:FE0D:670B
                        2001:9999::405
Loopback1               [up/up]
                        unassigned
```

Obrázek 55: WAN1 IPv6 interface brief

```

WAN2(config)#do sh ipv6 int br
GigabitEthernet0/0      [administratively down/down]
    unassigned
GigabitEthernet0/1      [up/up]
    FE80::5054:FF:FE1C:3953
    2001:9999::9
GigabitEthernet0/2      [up/up]
    FE80::5054:FF:FE02:DE55
    2001:9999::D
GigabitEthernet0/3      [up/up]
    unassigned
GigabitEthernet0/3.9    [up/up]
    FE80::5054:FF:FE11:C5A
    2001:9999::6
GigabitEthernet0/3.91   [up/up]
    unassigned
GigabitEthernet0/4      [up/up]
    unassigned
GigabitEthernet0/4.9    [up/up]
    FE80::5054:FF:FE0D:9884
    2001:9999::2
GigabitEthernet0/4.91   [up/up]
    unassigned
Loopback0               [up/up]
    FE80::5054:FF:FE1D:FB56
    2001:9999::408
Loopback1               [up/up]
    unassigned

```

Obrázek 56: WAN2 IPv6 interface brief

```
R1(config)#do sh ipv6 int br
GigabitEthernet0/0      [up/up]
    unassigned
GigabitEthernet0/0.9    [deleted/down]
    unassigned
GigabitEthernet0/1      [up/up]
    unassigned
GigabitEthernet0/1.18   [up/up]
    unassigned
GigabitEthernet0/1.101  [up/up]
    FE80::5054:FF:FE06:69A1
    2001:9999:1::
    2001:9999:1::1
GigabitEthernet0/1.102 [up/up]
    FE80::5054:FF:FE06:69A1
    2001:9999:1:1::
    2001:9999:1:1::1
GigabitEthernet0/1.103 [up/up]
    FE80::5054:FF:FE06:69A1
    2001:9999:1:2::
    2001:9999:1:2::1
GigabitEthernet0/1.301 [up/up]
    FE80::5054:FF:FE06:69A1
    2001:9999:2::
    2001:9999:2::1
GigabitEthernet0/1.302 [up/up]
    FE80::5054:FF:FE06:69A1
    2001:9999:2:1::
    2001:9999:2:1::1
GigabitEthernet0/1.303 [up/up]
    FE80::5054:FF:FE06:69A1
    2001:9999:2:2::
    2001:9999:2:2::1
GigabitEthernet0/2      [up/up]
    unassigned
GigabitEthernet0/2.9    [up/up]
    FE80::5054:FF:FE02:5CF
    2001:9999::3
GigabitEthernet0/2.91   [up/up]
    unassigned
GigabitEthernet0/3      [up/up]
    unassigned
GigabitEthernet0/3.9    [up/up]
    FE80::5054:FF:FE1F:1E47
```

Obrázek 57: R1 IPv6 interface brief 1/2

```
2001:9999::  
2001:9999::1  
GigabitEthernet0/3.91    [up/up]  
    unassigned  
Loopback0                [up/up]  
    FE80::5054:FF:FE08:4BB5  
    2001:9999::403  
Loopback1                [up/up]  
    unassigned
```

Obrázek 58: R1 IPv6 interface brief 2/2

```
R2(config)#do sh ipv6 int br
GigabitEthernet0/0      [up/up]
    unassigned
GigabitEthernet0/0.9    [deleted/down]
    unassigned
GigabitEthernet0/1      [up/up]
    unassigned
GigabitEthernet0/1.18   [up/up]
    unassigned
GigabitEthernet0/1.101  [up/up]
    FE80::5054:FF:FE17:C2F3
    2001:9999:1::
    2001:9999:1::2
GigabitEthernet0/1.102 [up/up]
    FE80::5054:FF:FE17:C2F3
    2001:9999:1:1::
    2001:9999:1:1::2
GigabitEthernet0/1.103 [up/up]
    FE80::5054:FF:FE17:C2F3
    2001:9999:1:2::
    2001:9999:1:2::2
GigabitEthernet0/1.301 [up/up]
    FE80::5054:FF:FE17:C2F3
    2001:9999:2::
    2001:9999:2::2
GigabitEthernet0/1.302 [up/up]
    FE80::5054:FF:FE17:C2F3
    2001:9999:2:1::
    2001:9999:2:1::2
GigabitEthernet0/1.303 [up/up]
    FE80::5054:FF:FE17:C2F3
    2001:9999:2:2::
    2001:9999:2:2::2
GigabitEthernet0/2      [up/up]
    unassigned
GigabitEthernet0/2.9    [up/up]
    FE80::5054:FF:FE1B:7390
    2001:9999::5
GigabitEthernet0/2.91   [up/up]
    unassigned
GigabitEthernet0/3      [up/up]
    unassigned
GigabitEthernet0/3.9    [up/up]
```

Obrázek 59: R2 IPv6 interface brief 1/2

```
FE80::5054:FF:FE02:4B2E
2001:9999::7
GigabitEthernet0/3.91    [up/up]
    unassigned
Loopback0                [up/up]
    FE80::5054:FF:FE11:7D40
    2001:9999::404
Loopback1                [up/up]
    unassigned
```

Obrázek 60: R2 IPv6 interface brief 1/2

```
DLSW1(config)#do sh ipv6 int br
GigabitEthernet0/0      [up/up]
    unassigned
GigabitEthernet0/1      [up/up]
    unassigned
GigabitEthernet0/1.101  [deleted/down]
    unassigned
GigabitEthernet0/2      [up/up]
    unassigned
GigabitEthernet0/3      [up/down]
    unassigned
GigabitEthernet1/0      [up/up]
    unassigned
Loopback0               [up/up]
    FE80::5054:FF:FE00:6E45
    2001:9999::400
Port-channel1           [up/up]
    unassigned
Vlan18                  [up/up]
    unassigned
```

Obrázek 61: DLSW1 IPv6 interface brief



```
GigabitEthernet0/0      [up/up]
    unassigned
GigabitEthernet0/1      [up/up]
    unassigned
GigabitEthernet0/2      [up/up]
    unassigned
GigabitEthernet0/3      [up/down]
    unassigned
GigabitEthernet1/0      [up/up]
    unassigned
Loopback0               [up/up]
    FE80::5054:FF:FE01:6758
    2001:9999::401
Port-channel1           [up/up]
    unassigned
Vlan18                  [up/up]
    unassigned
```

Obrázek 62: DLSW2 IPv6 interface brief

```
ALSW1(config)#do sh ipv6 int br
GigabitEthernet0/0      [up/up]
    unassigned
GigabitEthernet0/1      [up/up]
    unassigned
GigabitEthernet0/2      [up/up]
    unassigned
GigabitEthernet0/3      [up/up]
    unassigned
GigabitEthernet1/0      [up/up]
    unassigned
GigabitEthernet1/1      [up/up]
    unassigned
GigabitEthernet1/2      [up/up]
    unassigned
GigabitEthernet1/3      [up/up]
    unassigned
Loopback0                [up/up]
    FE80::5054:FF:FE0A:F92C
    2001:9999::402
Vlan18                   [up/up]
    unassigned
Vlan101                  [up/up]
    FE80::5054:FF:FE0A:8065
    2001:9999:1::3
Vlan102                  [up/up]
    unassigned
Vlan103                  [up/up]
    unassigned
Vlan301                  [up/up]
    unassigned
Vlan302                  [up/up]
    unassigned
Vlan303                  [up/up]
    unassigned
```

Obrázek 63: ALSW1 IPv6 interface brief

do sh ip route

```
1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    1.0.0.0/8 is directly connected, Loopback100
L    1.0.0.1/32 is directly connected, Loopback100
2.0.0.0/16 is subnetted, 1 subnets
B    2.0.0.0 [200/0] via 44.9.254.8, 02:15:52
44.0.0.0/8 is variably subnetted, 12 subnets, 5 masks
B    44.9.0.0/25 [20/1] via 44.9.248.10, 01:32:08
B    44.9.0.128/26 [20/1] via 44.9.248.10, 01:32:08
B    44.9.0.192/28 [20/1] via 44.9.248.10, 01:32:08
B    44.9.247.0/25 [20/1] via 44.9.248.10, 01:32:08
B    44.9.247.128/26 [20/1] via 44.9.248.10, 01:32:08
B    44.9.247.192/28 [20/1] via 44.9.248.10, 01:32:08
C    44.9.248.10/31 is directly connected, GigabitEthernet0/2
L    44.9.248.11/32 is directly connected, GigabitEthernet0/2
C    44.9.248.14/31 is directly connected, GigabitEthernet0/1
L    44.9.248.14/32 is directly connected, GigabitEthernet0/1
C    44.9.254.7/32 is directly connected, Loopback0
S    44.9.254.8/32 [1/0] via 44.9.248.15
```

Obrázek 64: ISP1 IPv4 routes

```
B    1.0.0.0/8 [200/0] via 44.9.254.7, 02:16:01
2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    2.0.0.0/16 is directly connected, Loopback100
L    2.0.0.1/32 is directly connected, Loopback100
44.0.0.0/8 is variably subnetted, 9 subnets, 5 masks
B    44.9.247.0/25 [20/1] via 44.9.248.12, 02:03:24
B    44.9.247.128/26 [20/1] via 44.9.248.12, 02:03:24
B    44.9.247.192/28 [20/1] via 44.9.248.12, 02:03:24
C    44.9.248.12/31 is directly connected, GigabitEthernet0/2
L    44.9.248.13/32 is directly connected, GigabitEthernet0/2
C    44.9.248.14/31 is directly connected, GigabitEthernet0/1
L    44.9.248.15/32 is directly connected, GigabitEthernet0/1
S    44.9.254.7/32 [1/0] via 44.9.248.14
C    44.9.254.8/32 is directly connected, Loopback0
```

Obrázek 65: ISP2 IPv4 routes

```
B    1.0.0.0/8 [20/0] via 44.9.248.11, 02:04:29
2.0.0.0/16 is subnetted, 1 subnets
B    2.0.0.0 [20/0] via 44.9.248.11, 02:04:29
44.0.0.0/8 is variably subnetted, 20 subnets, 5 masks
O E2  44.9.0.0/25 [110/1] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
      [110/1] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
O E2  44.9.0.128/26 [110/1] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
      [110/1] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
O E2  44.9.0.192/28 [110/1] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
      [110/1] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
O E2  44.9.247.0/25 [110/1] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
      [110/1] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
O E2  44.9.247.128/26
      [110/1] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
      [110/1] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
O E2  44.9.247.192/28
      [110/1] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
      [110/1] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
C    44.9.248.0/31 is directly connected, GigabitEthernet0/3.9
L    44.9.248.1/32 is directly connected, GigabitEthernet0/3.9
O    44.9.248.2/31 [110/51] via 44.9.248.9, 01:33:24, GigabitEthernet0/1
C    44.9.248.4/31 is directly connected, GigabitEthernet0/4.9
L    44.9.248.5/32 is directly connected, GigabitEthernet0/4.9
O    44.9.248.6/31 [110/51] via 44.9.248.9, 01:33:24, GigabitEthernet0/1
C    44.9.248.8/31 is directly connected, GigabitEthernet0/1
L    44.9.248.8/32 is directly connected, GigabitEthernet0/1
C    44.9.248.10/31 is directly connected, GigabitEthernet0/2
L    44.9.248.10/32 is directly connected, GigabitEthernet0/2
O    44.9.254.3/32 [110/10] via 44.9.248.0, 01:33:24, GigabitEthernet0/3.9
O    44.9.254.4/32 [110/10] via 44.9.248.4, 00:33:14, GigabitEthernet0/4.9
C    44.9.254.5/32 is directly connected, Loopback0
O    44.9.254.6/32 [110/1] via 44.9.248.9, 01:33:24, GigabitEthernet0/1
```

Obrázek 66: WAN1 IPv4 routes

```

B    1.0.0.0/8 [20/0] via 44.9.248.13, 02:06:41
    2.0.0.0/16 is subnetted, 1 subnets
B    2.0.0.0 [20/0] via 44.9.248.13, 02:06:41
    44.0.0.0/8 is variably subnetted, 20 subnets, 5 masks
O E2  44.9.0.0/25 [110/1] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O E2  44.9.0.128/26 [110/1] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O E2  44.9.0.192/28 [110/1] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O E2  44.9.247.0/25 [110/1] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O E2  44.9.247.128/26 [110/1] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O E2  44.9.247.192/28 [110/1] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O    44.9.248.0/31 [110/11] via 44.9.248.8, 01:35:25, GigabitEthernet0/1
C    44.9.248.2/31 is directly connected, GigabitEthernet0/4.9
L    44.9.248.3/32 is directly connected, GigabitEthernet0/4.9
O    44.9.248.4/31 [110/11] via 44.9.248.8, 00:35:19, GigabitEthernet0/1
C    44.9.248.6/31 is directly connected, GigabitEthernet0/3.9
L    44.9.248.7/32 is directly connected, GigabitEthernet0/3.9
C    44.9.248.8/31 is directly connected, GigabitEthernet0/1
L    44.9.248.9/32 is directly connected, GigabitEthernet0/1
C    44.9.248.12/31 is directly connected, GigabitEthernet0/2
L    44.9.248.12/32 is directly connected, GigabitEthernet0/2
O    44.9.254.3/32 [110/11] via 44.9.248.8, 01:35:25, GigabitEthernet0/1
O    44.9.254.4/32 [110/11] via 44.9.248.8, 00:35:29, GigabitEthernet0/1
O    44.9.254.5/32 [110/1] via 44.9.248.8, 01:35:25, GigabitEthernet0/1
C    44.9.254.6/32 is directly connected, Loopback0

```

Obrázek 67: WAN2 IPv4 routes

```

O*E2  0.0.0.0/0 [110/1] via 44.9.248.1, 01:10:48, GigabitEthernet0/3.9
    44.0.0.0/8 is variably subnetted, 23 subnets, 5 masks
C    44.9.0.0/25 is directly connected, GigabitEthernet0/1.101
L    44.9.0.2/32 is directly connected, GigabitEthernet0/1.101
C    44.9.0.128/26 is directly connected, GigabitEthernet0/1.102
L    44.9.0.130/32 is directly connected, GigabitEthernet0/1.102
C    44.9.0.192/28 is directly connected, GigabitEthernet0/1.103
L    44.9.0.194/32 is directly connected, GigabitEthernet0/1.103
C    44.9.247.0/25 is directly connected, GigabitEthernet0/1.301
L    44.9.247.2/32 is directly connected, GigabitEthernet0/1.301
C    44.9.247.128/26 is directly connected, GigabitEthernet0/1.302
L    44.9.247.130/32 is directly connected, GigabitEthernet0/1.302
C    44.9.247.192/28 is directly connected, GigabitEthernet0/1.303
L    44.9.247.194/32 is directly connected, GigabitEthernet0/1.303
C    44.9.248.0/31 is directly connected, GigabitEthernet0/3.9
L    44.9.248.0/32 is directly connected, GigabitEthernet0/3.9
C    44.9.248.2/31 is directly connected, GigabitEthernet0/2.9
L    44.9.248.2/32 is directly connected, GigabitEthernet0/2.9
O    44.9.248.4/31 [110/20] via 44.9.248.1, 00:10:31, GigabitEthernet0/3.9
O    44.9.248.6/31 [110/61] via 44.9.248.1, 01:10:48, GigabitEthernet0/3.9
O    44.9.248.8/31 [110/11] via 44.9.248.1, 01:10:48, GigabitEthernet0/3.9
C    44.9.254.3/32 is directly connected, Loopback0
O    44.9.254.4/32 [110/20] via 44.9.248.1, 00:10:41, GigabitEthernet0/3.9
O    44.9.254.5/32 [110/10] via 44.9.248.1, 01:10:48, GigabitEthernet0/3.9
O    44.9.254.6/32 [110/11] via 44.9.248.1, 01:10:48, GigabitEthernet0/3.9

```

Obrázek 68: R1 IPv4 routes

```

O*E2 0.0.0.0/0 [110/1] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9
      44.0.0.0/8 is variably subnetted, 23 subnets, 5 masks
C      44.9.0.0/25 is directly connected, GigabitEthernet0/1.101
L      44.9.0.3/32 is directly connected, GigabitEthernet0/1.101
C      44.9.0.128/26 is directly connected, GigabitEthernet0/1.102
L      44.9.0.131/32 is directly connected, GigabitEthernet0/1.102
C      44.9.0.192/28 is directly connected, GigabitEthernet0/1.103
L      44.9.0.195/32 is directly connected, GigabitEthernet0/1.103
C      44.9.247.0/25 is directly connected, GigabitEthernet0/1.301
L      44.9.247.3/32 is directly connected, GigabitEthernet0/1.301
C      44.9.247.128/26 is directly connected, GigabitEthernet0/1.302
L      44.9.247.131/32 is directly connected, GigabitEthernet0/1.302
C      44.9.247.192/28 is directly connected, GigabitEthernet0/1.303
L      44.9.247.195/32 is directly connected, GigabitEthernet0/1.303
O      44.9.248.0/31 [110/20] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9
O      44.9.248.2/31 [110/61] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9
C      44.9.248.4/31 is directly connected, GigabitEthernet0/2.9
L      44.9.248.4/32 is directly connected, GigabitEthernet0/2.9
C      44.9.248.6/31 is directly connected, GigabitEthernet0/3.9
L      44.9.248.6/32 is directly connected, GigabitEthernet0/3.9
O      44.9.248.8/31 [110/11] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9
O      44.9.254.3/32 [110/20] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9
C      44.9.254.4/32 is directly connected, Loopback0
O      44.9.254.5/32 [110/10] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9
O      44.9.254.6/32 [110/11] via 44.9.248.5, 00:11:11, GigabitEthernet0/2.9

```

Obrázek 69: R2 IPv4 routes

do sh ipv6 route

```

C      2001:9999::A/127 [0/0]
      via GigabitEthernet0/2, directly connected
L      2001:9999::A/128 [0/0]
      via GigabitEthernet0/2, receive
C      2001:9999::E/127 [0/0]
      via GigabitEthernet0/1, directly connected
L      2001:9999::E/128 [0/0]
      via GigabitEthernet0/1, receive
LC     2001:9999::407/128 [0/0]
      via Loopback0, receive
S      2001:9999::408/128 [1/0]
      via 2001:9999::F
C      2001:9999:1000::/48 [0/0]
      via Loopback100, directly connected
L      2001:9999:1000::1/128 [0/0]
      via Loopback100, receive
L      FF00::/8 [0/0]
      via Null0, receive

```

Obrázek 70: ISP1 IPv6 routes

```

C 2001:9999::C/127 [0/0]
   via GigabitEthernet0/2, directly connected
L 2001:9999::C/128 [0/0]
   via GigabitEthernet0/2, receive
C 2001:9999::E/127 [0/0]
   via GigabitEthernet0/1, directly connected
L 2001:9999::F/128 [0/0]
   via GigabitEthernet0/1, receive
S 2001:9999::407/128 [1/0]
   via 2001:9999::E
LC 2001:9999::408/128 [0/0]
   via Loopback0, receive
B 2001:9999:1000::/48 [200/0]
   via 2001:9999::407
C 2001:9999:2000::/56 [0/0]
   via Loopback100, directly connected
L 2001:9999:2000::1/128 [0/0]
   via Loopback100, receive
L FF00::/8 [0/0]
   via Null0, receive

```

Obrázek 71: ISP2 IPv6 routes

```

C 2001:9999::/127 [0/0]
   via GigabitEthernet0/3.9, directly connected
O 2001:9999::2/127 [110/51]
   via FE80::5054:FF:FE1C:3953, GigabitEthernet0/1
C 2001:9999::4/127 [0/0]
   via GigabitEthernet0/4.9, directly connected
L 2001:9999::4/128 [0/0]
   via GigabitEthernet0/4.9, receive
O 2001:9999::6/127 [110/51]
   via FE80::5054:FF:FE1C:3953, GigabitEthernet0/1
C 2001:9999::8/127 [0/0]
   via GigabitEthernet0/1, directly connected
L 2001:9999::8/128 [0/0]
   via GigabitEthernet0/1, receive
C 2001:9999::A/127 [0/0]
   via GigabitEthernet0/2, directly connected
L 2001:9999::B/128 [0/0]
   via GigabitEthernet0/2, receive
O 2001:9999::403/128 [110/10]
   via FE80::5054:FF:FE1F:1E47, GigabitEthernet0/3.9
O 2001:9999::404/128 [110/10]
   via FE80::5054:FF:FE1B:7390, GigabitEthernet0/4.9
LC 2001:9999::405/128 [0/0]
   via Loopback0, receive
O 2001:9999::408/128 [110/1]
   via FE80::5054:FF:FE1C:3953, GigabitEthernet0/1
B 2001:9999:1000::/48 [20/0]
   via FE80::5054:FF:FE14:A49F, GigabitEthernet0/2
L FF00::/8 [0/0]
   via Null0, receive

```

Obrázek 72: WAN1 IPv6 routes

```

O 2001:9999::/127 [110/11]
   via FE80::5054:FF:FE1B:E376, GigabitEthernet0/1
C 2001:9999::2/127 [0/0]
   via GigabitEthernet0/4.9, directly connected
L 2001:9999::2/128 [0/0]
   via GigabitEthernet0/4.9, receive
O 2001:9999::4/127 [110/11]
   via FE80::5054:FF:FE1B:E376, GigabitEthernet0/1
C 2001:9999::6/127 [0/0]
   via GigabitEthernet0/3.9, directly connected
L 2001:9999::6/128 [0/0]
   via GigabitEthernet0/3.9, receive
C 2001:9999::8/127 [0/0]
   via GigabitEthernet0/1, directly connected
L 2001:9999::9/128 [0/0]
   via GigabitEthernet0/1, receive
C 2001:9999::C/127 [0/0]
   via GigabitEthernet0/2, directly connected
L 2001:9999::D/128 [0/0]
   via GigabitEthernet0/2, receive
O 2001:9999::403/128 [110/11]
   via FE80::5054:FF:FE1B:E376, GigabitEthernet0/1
O 2001:9999::404/128 [110/11]
   via FE80::5054:FF:FE1B:E376, GigabitEthernet0/1
O 2001:9999::405/128 [110/1]
   via FE80::5054:FF:FE1B:E376, GigabitEthernet0/1
LC 2001:9999::408/128 [0/0]
   via Loopback0, receive
B 2001:9999:1000::/48 [20/0]
   via FE80::5054:FF:FE06:8F9B, GigabitEthernet0/2
L FF00::/8 [0/0]
   via Null0, receive

```

Obrázek 73: WAN2 IPv6 routes

```

OE2 ::/0 [110/1], tag 2
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
C 2001:9999::/127 [0/0]
   via GigabitEthernet0/3.9, directly connected
L 2001:9999::/128 [0/0]
   via GigabitEthernet0/3.9, receive
L 2001:9999::1/128 [0/0]
   via GigabitEthernet0/3.9, receive
C 2001:9999::2/127 [0/0]
   via GigabitEthernet0/2.9, directly connected
L 2001:9999::3/128 [0/0]
   via GigabitEthernet0/2.9, receive
O 2001:9999::4/127 [110/20]
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
O 2001:9999::6/127 [110/61]
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
O 2001:9999::8/127 [110/11]
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
LC 2001:9999::403/128 [0/0]
   via Loopback0, receive
O 2001:9999::404/128 [110/20]
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
O 2001:9999::405/128 [110/10]
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
O 2001:9999::408/128 [110/11]
   via FE80::5054:FF:FE0A:6D0E, GigabitEthernet0/3.9
C 2001:9999:1::/64 [0/0]
   via GigabitEthernet0/1.101, directly connected

```

Obrázek 74: R1 IPv6 routes 1/2

```

L 2001:9999:1::1/128 [0/0]
   via GigabitEthernet0/1.101, receive
C 2001:9999:1:1::/64 [0/0]
   via GigabitEthernet0/1.102, directly connected
L 2001:9999:1:1::1/128 [0/0]
   via GigabitEthernet0/1.102, receive
C 2001:9999:1:2::/64 [0/0]
   via GigabitEthernet0/1.103, directly connected
L 2001:9999:1:2::1/128 [0/0]
   via GigabitEthernet0/1.103, receive
C 2001:9999:2::/64 [0/0]
   via GigabitEthernet0/1.301, directly connected
L 2001:9999:2::1/128 [0/0]
   via GigabitEthernet0/1.301, receive
L 2001:9999:2:1::1/128 [0/0]
   via GigabitEthernet0/1.301, receive
C 2001:9999:2:1::/64 [0/0]
   via GigabitEthernet0/1.302, directly connected
L 2001:9999:2:1::1/128 [0/0]
   via GigabitEthernet0/1.302, receive
L 2001:9999:2:1:1/128 [0/0]
   via GigabitEthernet0/1.302, receive
C 2001:9999:2:2::/64 [0/0]
   via GigabitEthernet0/1.303, directly connected
L 2001:9999:2:2::1/128 [0/0]
   via GigabitEthernet0/1.303, receive
L 2001:9999:2:2:1/128 [0/0]
   via GigabitEthernet0/1.303, receive
L FF00::/8 [0/0]
   via Null0, receive

```

Obrázek 75: R1 IPv6 routes 2/2

```

OE2 ::/0 [110/1], tag 2
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9
O 2001:9999::/127 [110/20]
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9
O 2001:9999:2/127 [110/61]
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9
C 2001:9999::4/127 [0/0]
   via GigabitEthernet0/2.9, directly connected
L 2001:9999:5/128 [0/0]
   via GigabitEthernet0/2.9, receive
C 2001:9999:6/127 [0/0]
   via GigabitEthernet0/3.9, directly connected
L 2001:9999:7/128 [0/0]
   via GigabitEthernet0/3.9, receive
O 2001:9999:8/127 [110/11]
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9
O 2001:9999:403/128 [110/20]
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9
LC 2001:9999:404/128 [0/0]
   via Loopback0, receive
O 2001:9999:405/128 [110/10]
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9
O 2001:9999:408/128 [110/11]
   via FE80::5054:FF:FE13:CC01, GigabitEthernet0/2.9

```

Obrázek 76: R2 IPv6 routes 1/2



```

C 2001:9999:1::/64 [0/0]
  via GigabitEthernet0/1.101, directly connected
L 2001:9999:1::/128 [0/0]
  via GigabitEthernet0/1.101, receive
L 2001:9999:1::2/128 [0/0]
  via GigabitEthernet0/1.101, receive
C 2001:9999:1:1::/64 [0/0]
  via GigabitEthernet0/1.102, directly connected
L 2001:9999:1:1::/128 [0/0]
  via GigabitEthernet0/1.102, receive
L 2001:9999:1:1::2/128 [0/0]
  via GigabitEthernet0/1.102, receive
C 2001:9999:1:2::/64 [0/0]
  via GigabitEthernet0/1.103, directly connected
L 2001:9999:1:2::/128 [0/0]
  via GigabitEthernet0/1.103, receive
L 2001:9999:1:2::2/128 [0/0]
  via GigabitEthernet0/1.103, receive
C 2001:9999:2::/64 [0/0]
  via GigabitEthernet0/1.301, directly connected
L 2001:9999:2::2/128 [0/0]
  via GigabitEthernet0/1.301, receive
C 2001:9999:2:1::/64 [0/0]
  via GigabitEthernet0/1.302, directly connected
L 2001:9999:2:1::2/128 [0/0]
  via GigabitEthernet0/1.302, receive
C 2001:9999:2:2::/64 [0/0]
  via GigabitEthernet0/1.303, directly connected
L 2001:9999:2:2::2/128 [0/0]
  via GigabitEthernet0/1.303, receive
L FF00::/8 [0/0]
  via Null0, receive

```

Obrázek 77: R2 IPv6 routes 2/2

do sh ospfv3 int br

```

R1(config)#do sh ospfv3 int br

```

Interface	PID	Area	AF	Cost	State	Nbrs	F/C
Lo0	1	0	ipv4	1	LOOP	0/0	
Gi0/3.9	1	0	ipv4	10	DR	1/1	
Gi0/2.9	1	0	ipv4	50	DR	1/1	
Lo0	2	0	ipv6	1	LOOP	0/0	
Gi0/3.9	2	0	ipv6	10	DR	1/1	
Gi0/2.9	2	0	ipv6	50	DR	1/1	
Gi0/0.9	4	0	ipv4	1	DR	0/0	
Gi0/1.103	4	1	ipv4	1	DR	0/0	
Gi0/1.102	4	1	ipv4	1	DR	0/0	
Gi0/1.101	4	1	ipv4	1	DR	0/0	
Gi0/1.303	4	2	ipv4	1	DR	0/0	
Gi0/1.302	4	2	ipv4	1	DR	0/0	
Gi0/1.301	4	2	ipv4	1	DR	0/0	
Gi0/0.9	6	0	ipv6	1	DR	0/0	
Gi0/1.103	6	1	ipv6	1	DR	0/0	
Gi0/1.102	6	1	ipv6	1	DR	0/0	
Gi0/1.101	6	1	ipv6	1	DR	0/0	
Gi0/1.303	6	2	ipv6	1	DR	0/0	
Gi0/1.302	6	2	ipv6	1	DR	0/0	
Gi0/1.301	6	2	ipv6	1	DR	0/0	

Obrázek 78: R1 OSPFv3 Brief

```
R2(config-if)#do sh ospfv3 int br
```

Interface	PID	Area	AF	Cost	State	Nbrs	F/C
Lo0	1	0	ipv4	1	LOOP	0/0	
Gi0/3.9	1	0	ipv4	50	BDR	1/1	
Gi0/2.9	1	0	ipv4	10	DR	0/0	
Lo0	2	0	ipv6	1	LOOP	0/0	
Gi0/3.9	2	0	ipv6	50	BDR	1/1	
Gi0/2.9	2	0	ipv6	10	DR	0/0	
Gi0/0.9	4	0	ipv4	1	DR	0/0	
Gi0/1.103	4	1	ipv4	1	DR	0/0	
Gi0/1.102	4	1	ipv4	1	DR	0/0	
Gi0/1.101	4	1	ipv4	1	DR	0/0	
Gi0/1.303	4	2	ipv4	1	DR	0/0	
Gi0/1.302	4	2	ipv4	1	DR	0/0	
Gi0/1.301	4	2	ipv4	1	DR	0/0	
Gi0/0.9	6	0	ipv6	1	DR	0/0	
Gi0/1.103	6	1	ipv6	1	DR	0/0	
Gi0/1.102	6	1	ipv6	1	DR	0/0	
Gi0/1.101	6	1	ipv6	1	DR	0/0	
Gi0/1.303	6	2	ipv6	1	DR	0/0	
Gi0/1.302	6	2	ipv6	1	DR	0/0	
Gi0/1.301	6	2	ipv6	1	DR	0/0	

Obrázek 79: R2 OSPFv3 Brief

```
WAN1(config-if)#do sh ospfv3 int br
```

Interface	PID	Area	AF	Cost	State	Nbrs	F/C
Lo0	1	0	ipv4	1	LOOP	0/0	
Gi0/4.9	1	0	ipv4	10	DOWN	0/0	
Gi0/3.9	1	0	ipv4	10	BDR	1/1	
Gi0/1	1	0	ipv4	1	BDR	1/1	
Lo0	2	0	ipv6	1	LOOP	0/0	
Gi0/4.9	2	0	ipv6	10	DOWN	0/0	
Gi0/3.9	2	0	ipv6	10	BDR	1/1	
Gi0/1	2	0	ipv6	1	BDR	1/1	

Obrázek 80: WAN1 OSPFv3 Brief

```
WAN2(config-router)#do sh ospfv3 int br
```

Interface	PID	Area	AF	Cost	State	Nbrs	F/C
Lo0	1	0	ipv4	1	LOOP	0/0	
Gi0/4.9	1	0	ipv4	50	BDR	1/1	
Gi0/3.9	1	0	ipv4	50	DR	1/1	
Gi0/1	1	0	ipv4	1	DR	1/1	
Lo0	2	0	ipv6	1	LOOP	0/0	
Gi0/4.9	2	0	ipv6	50	BDR	1/1	
Gi0/3.9	2	0	ipv6	50	DR	1/1	
Gi0/1	2	0	ipv6	1	DR	1/1	

Obrázek 81: WAN2 OSPFv3 Brief

## 9 Link state

žádné bodíky nebudou :(

## **10 Konektivita IPv4**

### **10.1 Ping**

### **10.2 Traceroute**

## **11 Konektivita IPv6**

### **11.1 Ping**

### **11.2 Traceroute**