



ISP Operations –Troubleshooting OSPF for IPv4 and IPv6

PRESENTED BY:

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Profile: **About Kevin Myers**

Background:

- 19+ years in Networking
- Designed/Built Networks on 6 continents
- MikroTik Certified Trainer
- MikroTik, Cisco and Microsoft Certified



Community Involvement:



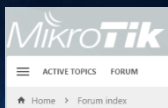
Packet Pushers (Podcast Guest / Blogger)



Group Contributor (RouterOS / WISP Talk and others)



Delegate/Roundtable contributor (NFD14)



MT Forum (Forum Veteran – Member since 2012)



Network Collective (Podcast Guest)



Profile: **About IP ArchiTechs**



ArchiTechs

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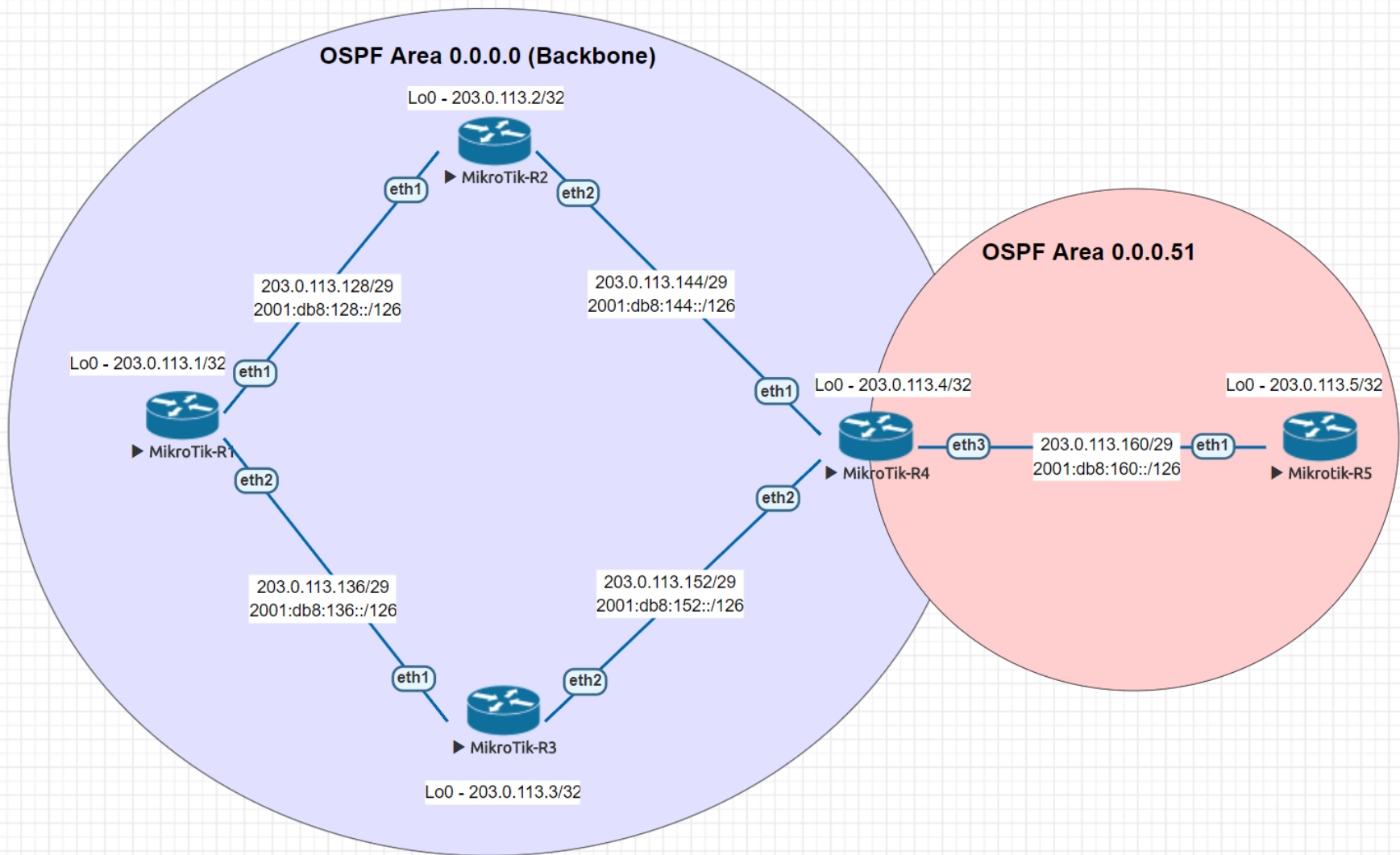
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Goal of this presentation: When the presentation is finished, hopefully you will have walked away with a few key concepts:

- How to troubleshoot issues with OSPF in RouterOS using verification and logging
- Similarities (and Differences) in troubleshooting OSPFv3 for IPv6 vs IPv4.
- Review of common issues and bugs
- MikroTik to Cisco for OSPF



- OSPFv2 Requires the following to form an adjacency:
 - Hello timers have to match
 - Dead timers have to match
 - Network-type has to match
 - Interfaces must be in the same area
 - MTU must match
- Let's look at what happens when these don't match



Section 1: OSPFv2 for IPv4

Basic troubleshooting scenarios

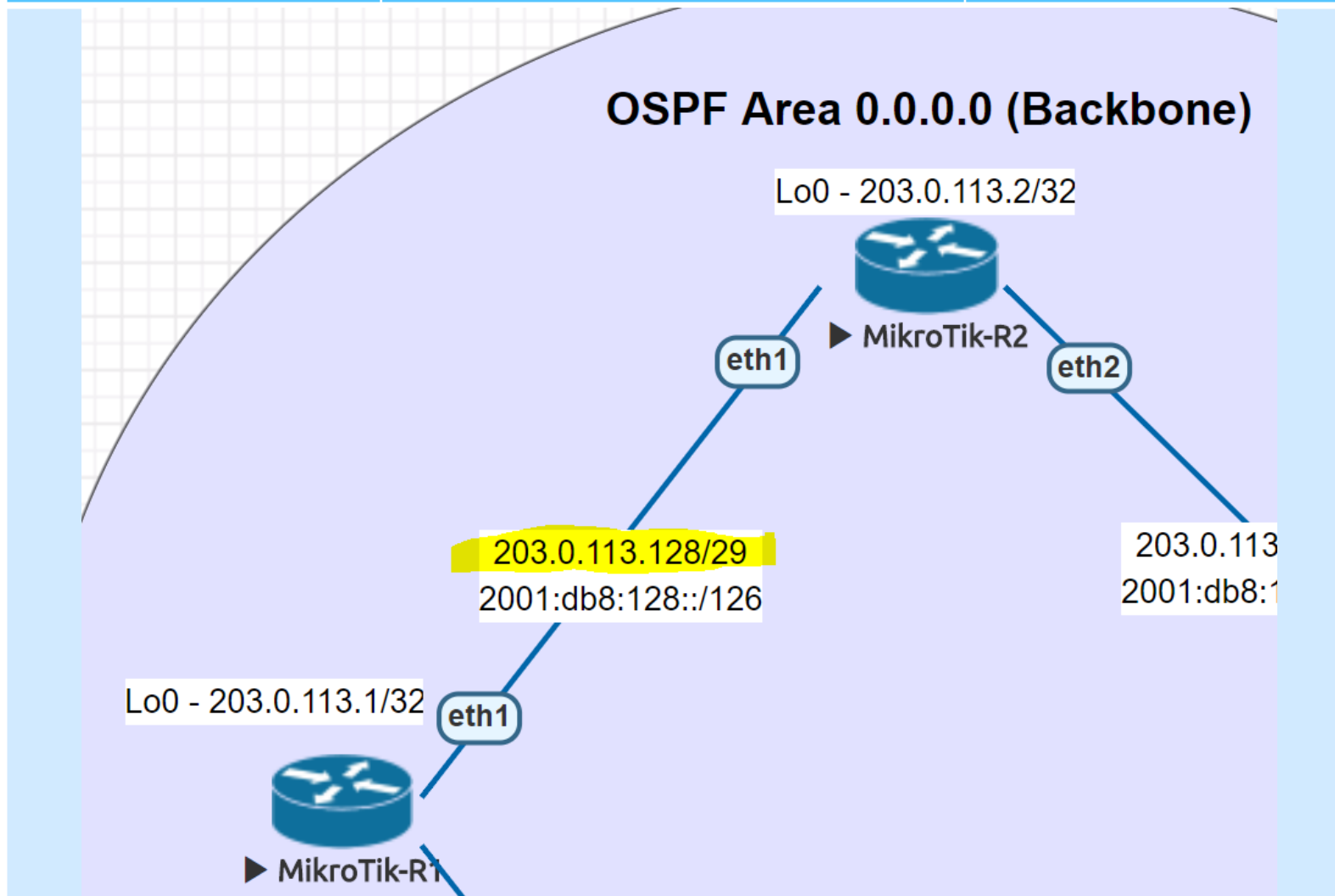


Scenario 1: Hello Timer Mismatch

OSPFv2

Hello Timer Mismatch

R1 to R2



OSPFv2	Hello Timer Mismatch	R1 to R2
R1 <pre>/routing ospf interface add dead-interval=1m20s hello-interval=20s interface=ether1</pre>		
R2 No interface config in export....what does this tell us? The interface was dynamically created and using default settings		



Operations: OSPF troubleshooting – interface status comparison

OSPFv2

Hello Timer Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf interface print detail
where interface
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0      interface=ether1 cost=10 priority=1 authentication=none
authentication-key="" authentication-key-id=1 network-
type=default instance-id=0 retransmit-interval=5s
      transmit-delay=1s hello-interval=20s dead-interval=1m20s
use-bfd=no
```

R2

```
[admin@MikroTik-R2] > routing ospf interface print detail
where interface=ether1
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0 D    interface=ether1 cost=10 priority=1 authentication=none
authentication-key="" authentication-key-id=1 network-
type=broadcast instance-id=0 retransmit-interval=5s
      transmit-delay=1s hello-interval=10s dead-interval=40s
use-bfd=no
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

Hello Timer Mismatch

R1 to R2

R1

```
12:34:22 route,ospf,info Discarding Hello
packet: mismatch in hello-interval
12:34:22 route,ospf,info mine=20
12:34:22 route,ospf,info remote=10
12:34:22 route,ospf,info
source=203.0.113.130
```

R2

```
13:00:08 route,ospf,info Discarding Hello
packet: mismatch in hello-interval
13:00:08 route,ospf,info mine=10
13:00:08 route,ospf,info remote=20
13:00:08 route,ospf,info
source=203.0.113.129
```

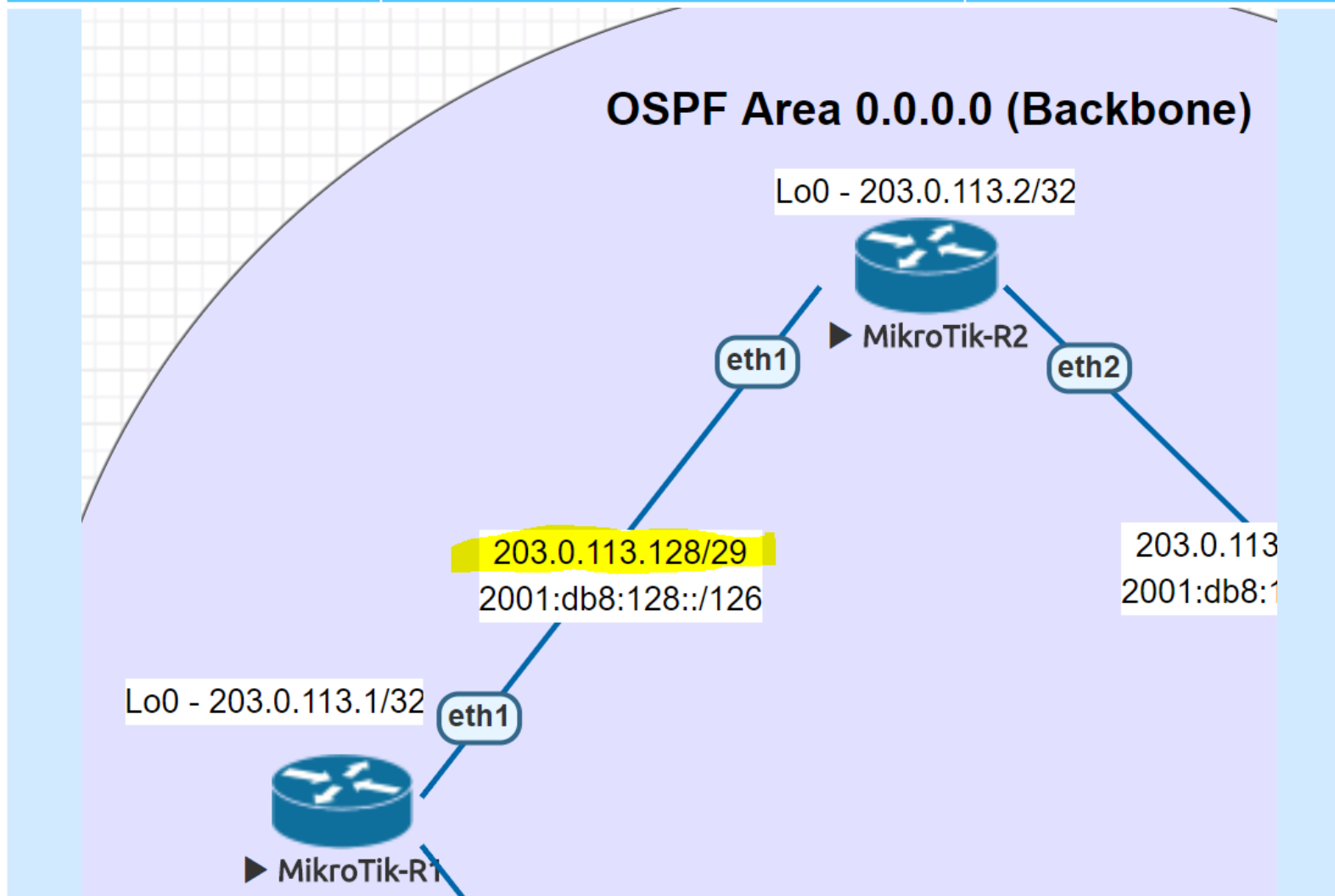


Scenario 2: Dead Timer Mismatch

OSPFv2

Hello Timer Mismatch

R1 to R2



OSPFv2	Dead Timer Mismatch	R1 to R2
R1 /routing ospf interface add dead-interval=1m20s interface=ether1		
R2 No interface config in export....what does this tell us? The interface was dynamically created and using default settings		



Operations: OSPF troubleshooting – interface status comparison

OSPFv2

Dead Timer Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf interface print detail
where interface
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0      interface=ether1 cost=10 priority=1 authentication=none
authentication-key="" authentication-key-id=1 network-
type=default instance-id=0 retransmit-interval=5s
      transmit-delay=1s hello-interval=10s dead-interval=1m20s
use-bfd=no
```

R2

```
[admin@MikroTik-R2] > routing ospf interface print detail
where interface=ether1
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0 D    interface=ether1 cost=10 priority=1 authentication=none
authentication-key="" authentication-key-id=1 network-
type=broadcast instance-id=0 retransmit-interval=5s
      transmit-delay=1s hello-interval=10s dead-interval=40s
use-bfd=no
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

Dead Timer Mismatch

R1 to R2

R1

```
12:34:22 route,ospf,info Discarding Hello
packet: mismatch in dead-interval
12:34:22 route,ospf,info mine=80
12:34:22 route,ospf,info remote=40
12:34:22 route,ospf,info
source=203.0.113.130
```

R2

```
13:00:08 route,ospf,info Discarding Hello
packet: mismatch in dead-interval
13:00:08 route,ospf,info mine=40
13:00:08 route,ospf,info remote=80
13:00:08 route,ospf,info
source=203.0.113.129
```

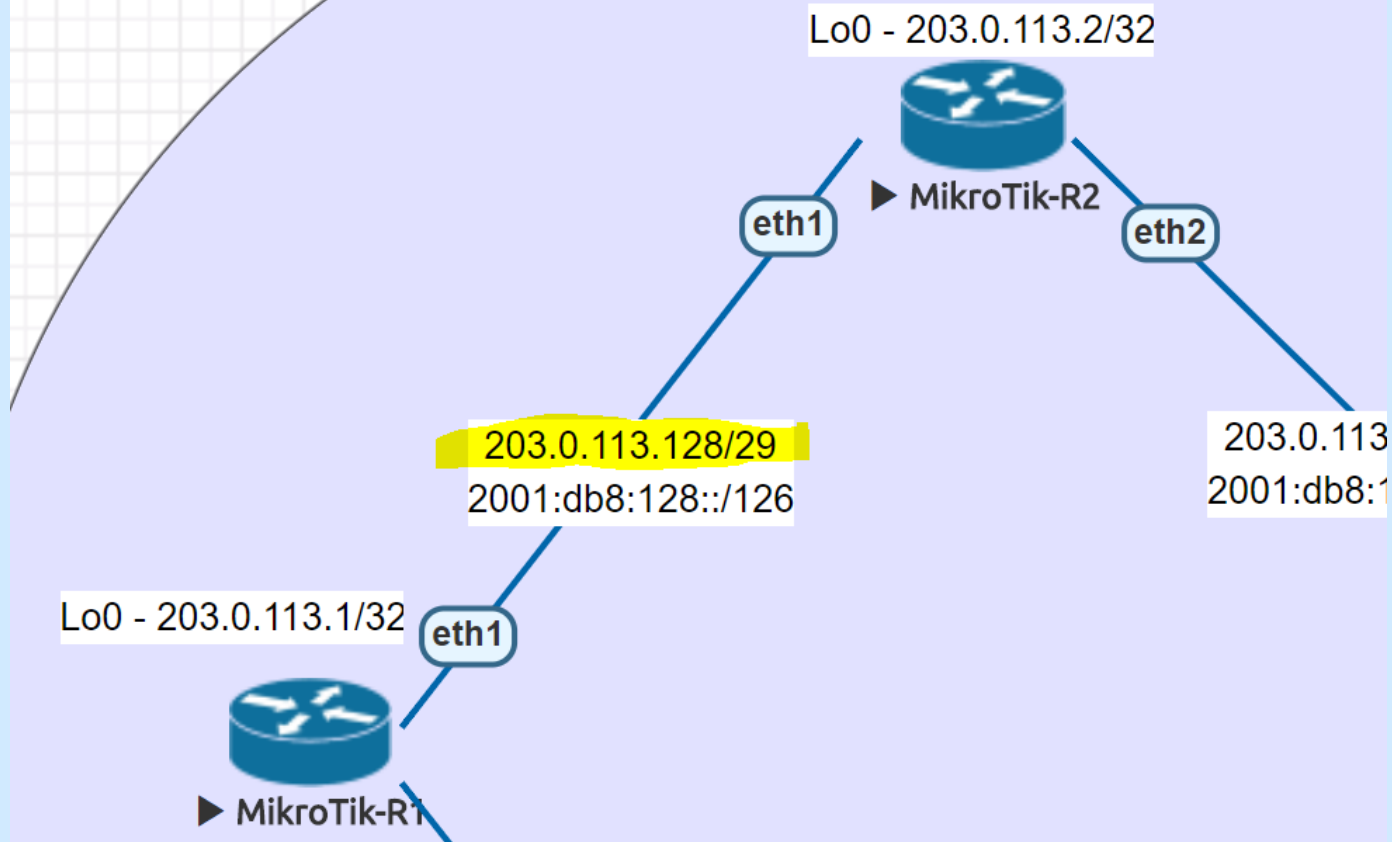
Scenario 3:

Network Type Mismatch

OSPFv2

Network Type Mismatch

R1 to R2

OSPF Area 0.0.0.0 (Backbone)

OSPFv2	Network Type Mismatch	R1 to R2
R1		
<pre>/routing ospf interface add interface=ether1 network- type=ptmp</pre>		
R2		
<pre>/routing ospf interface add interface=ether1 network- type=nbma</pre>		



Operations: OSPF troubleshooting – interface status comparison

OSPFv2

Network Type Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf interface print detail where interface=ether1
```

Flags: X - disabled, I - inactive, D - dynamic, P - passive

```
0 interface=ether1 cost=10 priority=1 authentication=none
authentication-key="" authentication-key-id=1 network-type=ptmp
instance-id=0 retransmit-interval=5s transmit-delay=1s
hello-interval=10s dead-interval=40s use-bfd=no
```

R2

```
[admin@MikroTik-R2] > routing ospf interface print detail
where interface=ether1
```

Flags: X - disabled, I - inactive, D - dynamic, P - passive

```
0 interface=ether1 cost=10 priority=1 authentication=none
authentication-key="" authentication-key-id=1 network-
type=nbma instance-id=0 retransmit-interval=5s transmit-
delay=1s
hello-interval=10s dead-interval=40s use-bfd=no
```



Operations: **OSPF troubleshooting – log comparison**

OSPFv2	Network Type Mismatch	R1 to R2
R1		
No log entry for this issue		
R2		
No log entry for this issue		

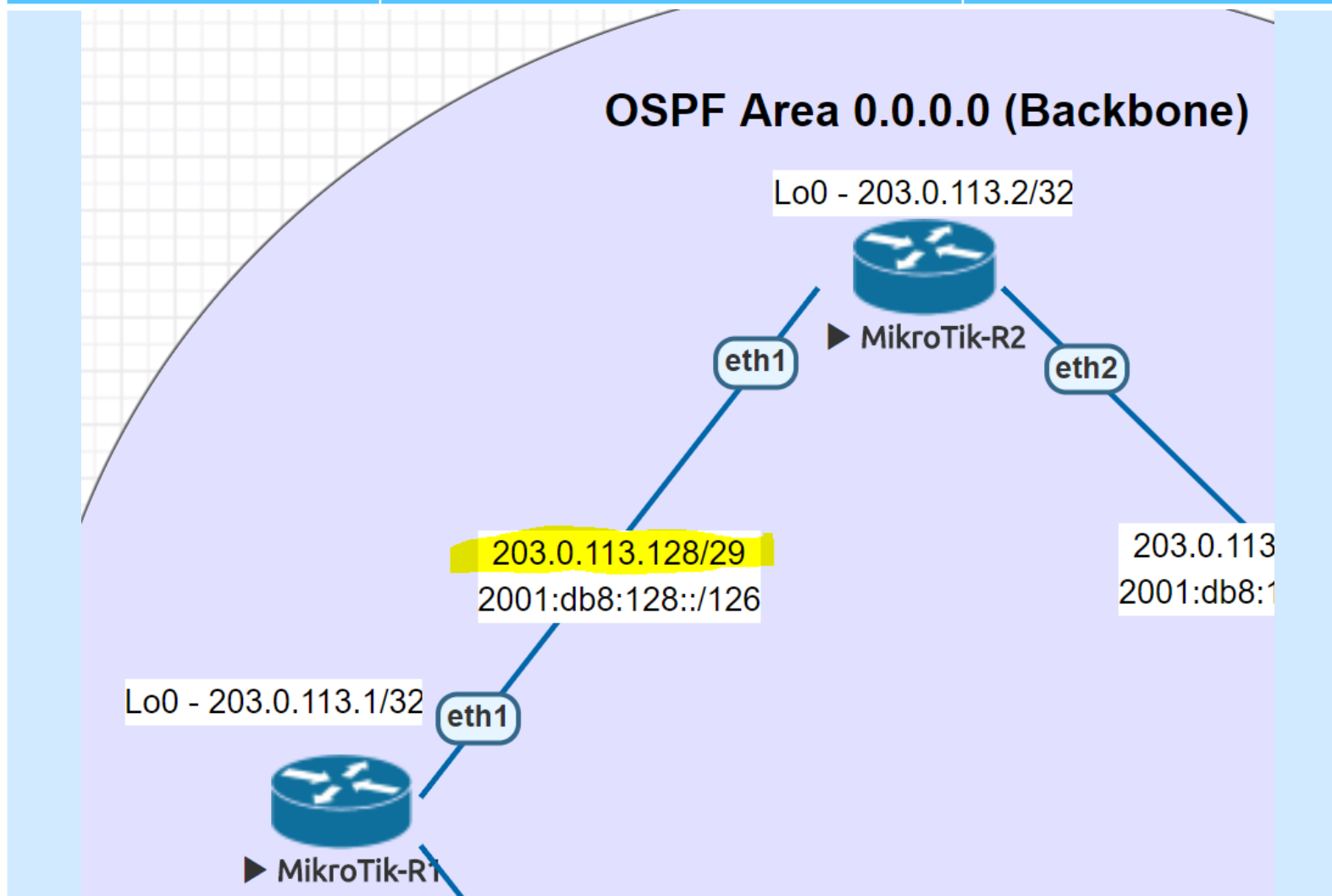


Scenario 4: Area Mismatch

OSPFv2

Area Mismatch

R1 to R2



OSPFv2	Area Mismatch	R1 to R2
R1 <pre>/routing ospf network add area=Area51 network=203.0.113.128/29 add area=backbone network=203.0.113.1/32 add area=backbone network=203.0.113.136/29</pre>		
R2 <pre>/routing ospf network add area=backbone network=203.0.113.128/29 add area=backbone network=203.0.113.2/32 add area=backbone network=203.0.113.144/29</pre>		



Operations: OSPF troubleshooting – ospf network comparison

OSPFv2

Area Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf network print
Flags: X - disabled, I - invalid
#      NETWORK          AREA
0      203.0.113.128/29  Area51
1      203.0.113.1/32    backbone
2      203.0.113.136/29  backbone
```

R2

```
[admin@MikroTik-R2] > routing ospf network print
Flags: X - disabled, I - invalid
#      NETWORK          AREA
0      203.0.113.128/29  backbone
1      203.0.113.2/32    backbone
2      203.0.113.144/29  backbone
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

Area Mismatch

R1 to R2

R1

21:02:55 route,ospf,info Discarding packet: mismatched area ID

21:02:55 route,ospf,info mine=0.0.0.51
21:02:55 route,ospf,info received=0.0.0.0
21:02:55 route,ospf,info source=203.0.113.130

R2

21:14:28 route,ospf,info Discarding packet: mismatched area ID

21:14:28 route,ospf,info mine=0.0.0.0
21:14:28 route,ospf,info received=0.0.0.51
21:14:28 route,ospf,info source=203.0.113.129

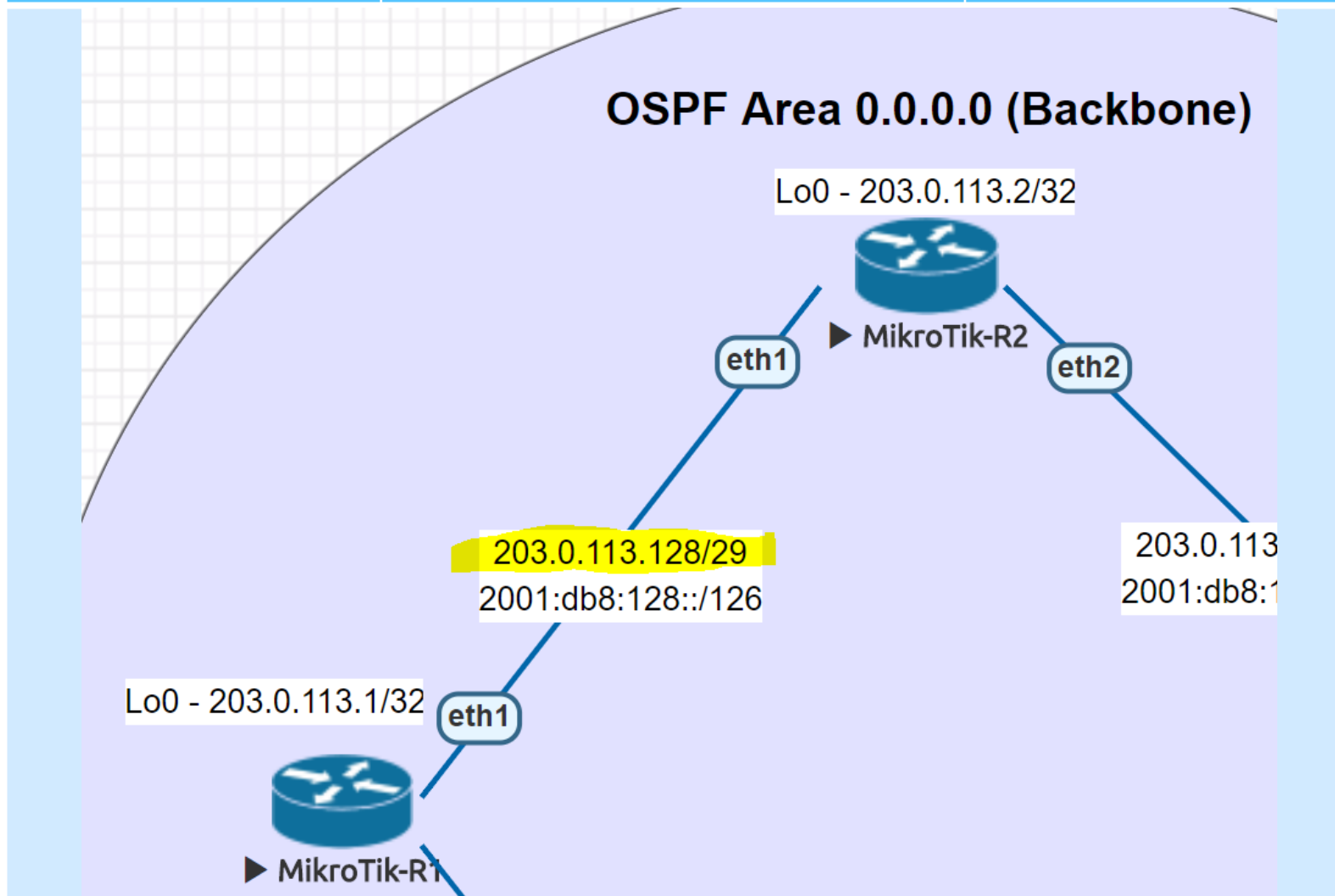


Scenario 5: MTU Mismatch

OSPFv2

Area Mismatch

R1 to R2



OSPFv2**MTU Mismatch****R1 to R2****R1**

```
/interface ethernet  
set [ find default-name=ether1 ] mtu=1450
```

R2

No MTU config in export....what does this tell us?

Layer 3 MTU is set to the default of 1500



Operations: OSPF troubleshooting – interface status comparison

OSPFv2

MTU Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > interface print detail where  
name=ether1
```

```
Flags: D - dynamic, X - disabled, R - running, S -  
slave
```

```
0 R name="ether1" default-name="ether1" type="ether"  
mtu=1450 actual-mtu=1450 mac-address=50:00:00:01:00:00  
fast-path=no last-link-up-time=apr/11/2018 20:57:38  
link-downs=0
```

R2

```
[admin@MikroTik-R2] > interface print detail where  
name=ether1
```

```
Flags: D - dynamic, X - disabled, R - running, S - slave
```

```
0 R name="ether1" default-name="ether1" type="ether"  
mtu=1500 actual-mtu=1500 mac-address=50:00:00:02:00:00  
fast-path=no last-link-up-time=apr/11/2018 20:57:40 link-  
downs=0
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

MTU Mismatch

R1 to R2

R1

```
21:59:57 route,ospf,info Discarding Database
Description packet: too large MTU
21:59:57 route,ospf,info mine=1450
21:59:57 route,ospf,info received=1500
```

R2

```
21:55:41 route,ospf,info Discarding Database
Description packet: different MTU
21:55:41 route,ospf,info mine=1500
21:55:41 route,ospf,info received=1450
```

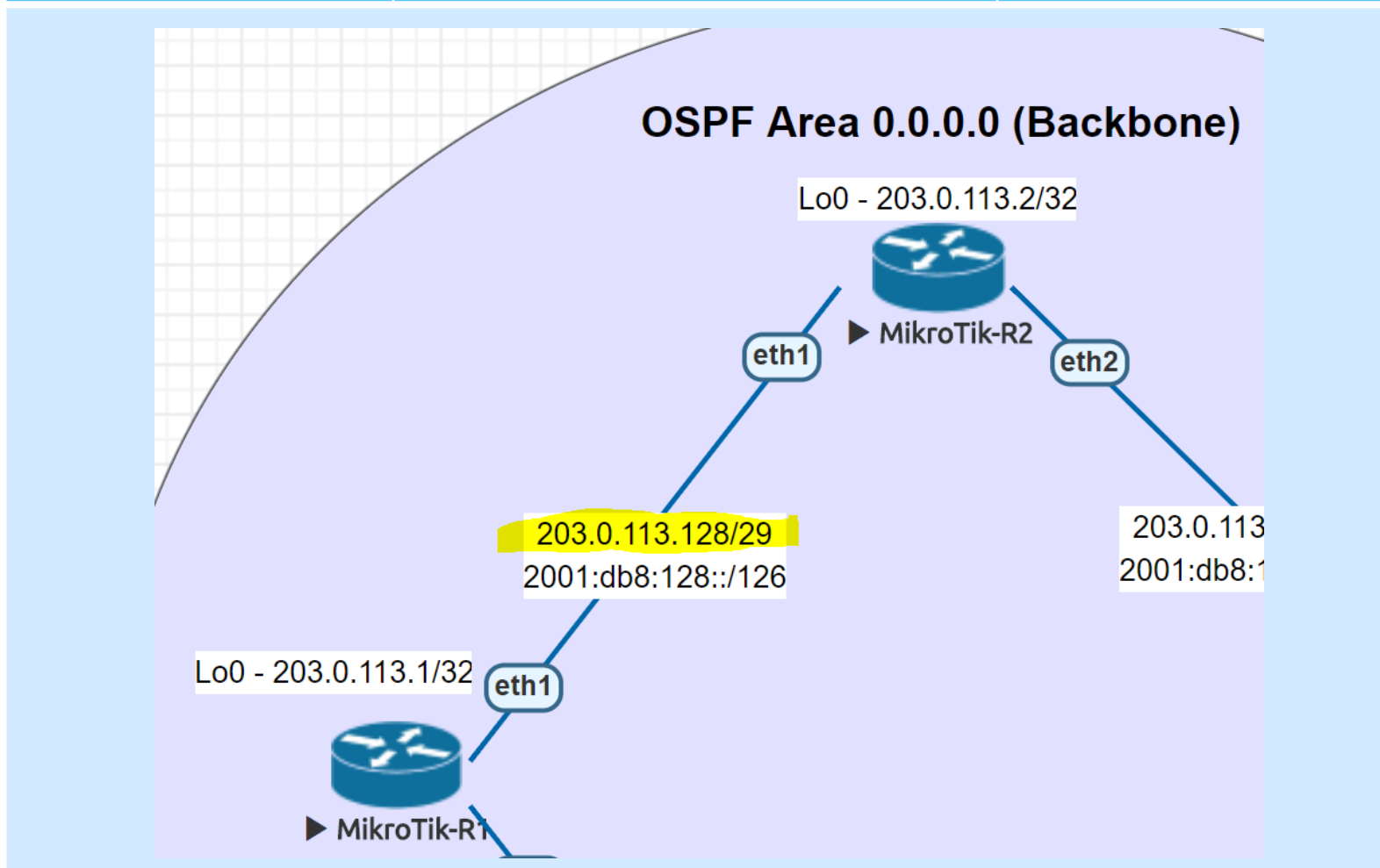


Section 2: OSPFv2 for IPv4

Advanced
troubleshooting
scenarios

Scenario 6:

Duplicate router-id on adjacent routers

OSPFv2**Duplicate router-id – adjacent routers****R1 to R2**



Operations: **OSPF troubleshooting – config comparison**

OSPFv2	Duplicate router-id – adjacent routers	R1 to R2
R1		
<pre>/routing ospf instance set [find default=yes] router-id=203.0.113.2</pre>		
R2		
<pre>/routing ospf instance set [find default=yes] router-id=203.0.113.2</pre>		



Operations: OSPF troubleshooting – interface status comparison

OSPFv2

Duplicate router-id – adjacent routers

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf instance print
```

Flags: X - disabled, * - default

```
0  * name="default" router-id=203.0.113.2 distribute-default=never
    redistribute-connected=no redistribute-static=no redistribute-rip=no
    redistribute-bgp=no redistribute-other-ospf=no metric-default=1
    metric-connected=20 metric-static=20 metric-rip=20 metric-bgp=auto
    metric-other-ospf=auto in-filter=ospf-in out-filter=ospf-out
```

R2

```
[admin@MikroTik-R2] > routing ospf instance print
```

Flags: X - disabled, * - default

```
0  * name="default" router-id=203.0.113.2 distribute-default=never
    redistribute-connected=no redistribute-static=no redistribute-rip=no
    redistribute-bgp=no redistribute-other-ospf=no metric-default=1
    metric-connected=20 metric-static=20 metric-rip=20 metric-bgp=auto
    metric-other-ospf=auto in-filter=ospf-in out-filter=ospf-out
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

Duplicate router-id –
adjacent routers

R1 to R2

R1

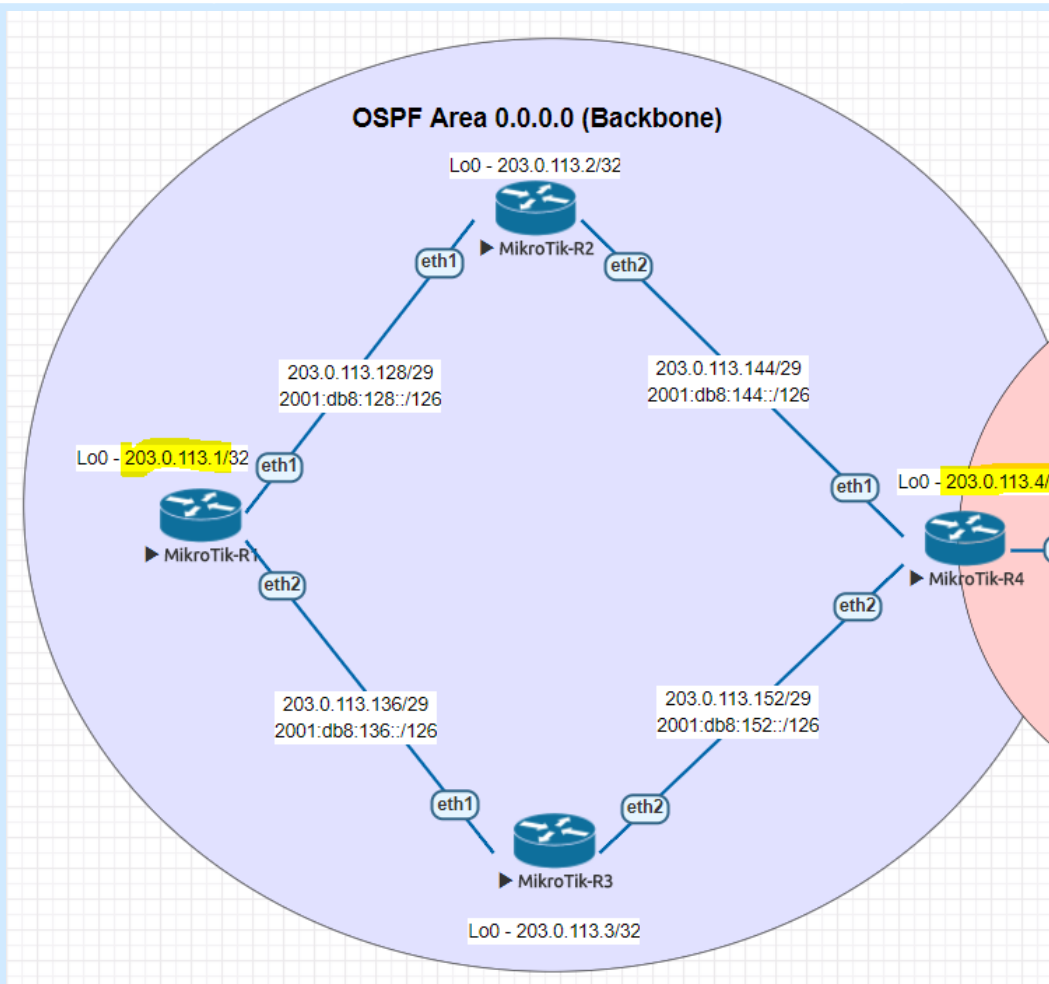
```
10:28:12 route,ospf,info local and remote router-id  
are the same
```

R2

```
10:27:26 route,ospf,info local and remote router-id  
are the same
```


Scenario 7:

Duplicate router-id on non-adjacent routers

OSPFv2**Duplicate router-id
non-adjacent routers****R1 and R4**

OSPFv2	Duplicate router-id – non-adjacent routers	R1 and R4
R1		
<pre>/routing ospf instance set [find default=yes] router-id=203.0.113.4</pre>		
R4		
<pre>/routing ospf instance set [find default=yes] router-id=203.0.113.4</pre>		



Operations: OSPF troubleshooting – interface status comparison

OSPFv2

Duplicate router-id – non-adjacent routers

R1 and R4

R1

```
[admin@MikroTik-R1] > routing ospf instance print
Flags: X - disabled, * - default
0 * name="default" router-id=203.0.113.4 distribute-default=never
redistribute-connected=no redistribute-static=no redistribute-rip=no
redistribute-bgp=no redistribute-other-ospf=no
metric-default=1 metric-connected=20 metric-static=20 metric-rip=20
metric-bgp=auto metric-other-ospf=auto in-filter=ospf-in out-filter=ospf-out
```

R4

```
[admin@MikroTik-R4] > routing ospf instance print
Flags: X - disabled, * - default
0 * name="default" router-id=203.0.113.4 distribute-default=never
redistribute-connected=no redistribute-static=no redistribute-rip=no
redistribute-bgp=no redistribute-other-ospf=no
metric-default=1 metric-connected=20 metric-static=20 metric-rip=20
metric-bgp=auto metric-other-ospf=auto in-filter=ospf-in out-filter=ospf-out
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

Duplicate router-id – non-adjacent routers

R1 to R2

R1

```
10:49:09 route,ospf,debug Received update of a self-originated LSA
10:49:09 route,ospf,debug      type=Network LSA
10:49:09 route,ospf,debug Installing an LSA
10:49:09 route,ospf,debug      lsa=Network LSA id=203.0.113.154
originator=203.0.113.4 seqnum=0x80000026
10:49:09 route,ospf,debug      old=Network LSA id=203.0.113.154
originator=203.0.113.4 seqnum=0x80000025
```

Log edited for brevity

```
10:49:09 route,ospf,debug Deleting an LSA
10:49:09 route,ospf,debug      lsa=Network LSA id=203.0.113.154
originator=203.0.113.4 seqnum=0x80000026
```

Comments

The default log settings will not display these messages. In order to see these, you'll have to add the following.

```
system log add topics=ospf action=memory
```



Operations: OSPF troubleshooting – log comparison

OSPFv2

Duplicate router-id – non-adjacent routers

R1 to R2

R4

```
12:09:49 route,ospf,debug Received update of a self-originated LSA
12:09:49 route,ospf,debug type=Network LSA
```

edited for brevity

```
12:09:50 route,ospf,debug Deleting an LSA
12:09:50 route,ospf,debug lsa=Network LSA id=203.0.113.146
originator=203.0.113.4 seqnum=0x80000093
```

Comments

Notice the term 'self-originated LSA' this means the router believes it has received an advertisement from itself. This is a good indication there is a router somewhere in the network with a duplicate router-id

Section 3: OSPFv3 for IPv6

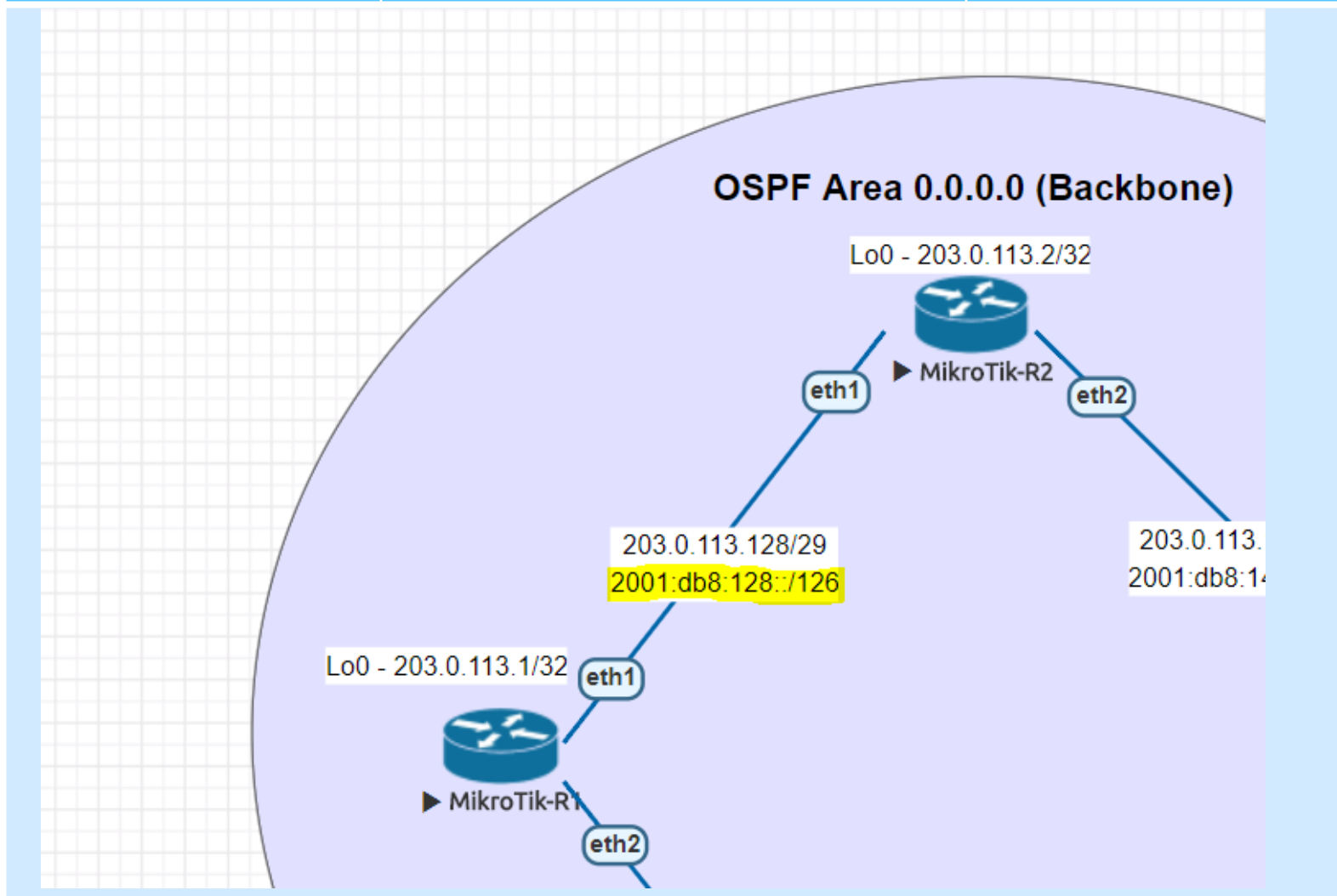
Basic troubleshooting scenarios

Scenario 8: Hello Timer Mismatch (IPv6)

OSPFv3

Hello Timer Mismatch

R1 to R2



OSPFv3	Hello Timer Mismatch	R1 to R2
R1 /routing ospf-v3 interface add area=backbone hello-interval=20s interface=ether1		
R2 No interface config in export....what does this tell us? The interface was dynamically created and using default settings		



Operations: OSPF troubleshooting – interface status comparison

OSPFv3

Hello Timer Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf-v3 interface print detail
where interface=ether1
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0      area=backbone interface=ether1 cost=10 priority=1
network-type=default retransmit-interval=5s transmit-delay=1s
hello-interval=20s dead-interval=40s instance-id=0 use-bfd=no
```

R2

```
[admin@MikroTik-R2] > routing ospf-v3 interface print detail
where interface=ether1
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0      area=backbone interface=ether1 cost=10 priority=1
network-type=default retransmit-interval=5s transmit-delay=1s
hello-interval=10s dead-interval=40s instance-id=0 use-bfd=no
```



Operations: OSPF troubleshooting – log comparison

OSPFv3

Hello Timer Mismatch

R1 to R2

R1

```
12:33:07 route,ospf,info Discarding Hello
packet: mismatch in hello-interval
12:33:07 route,ospf,info mine=20
12:33:07 route,ospf,info remote=10
12:33:07 route,ospf,info
source=fe80::5200:ff:fe02:0
```

R2

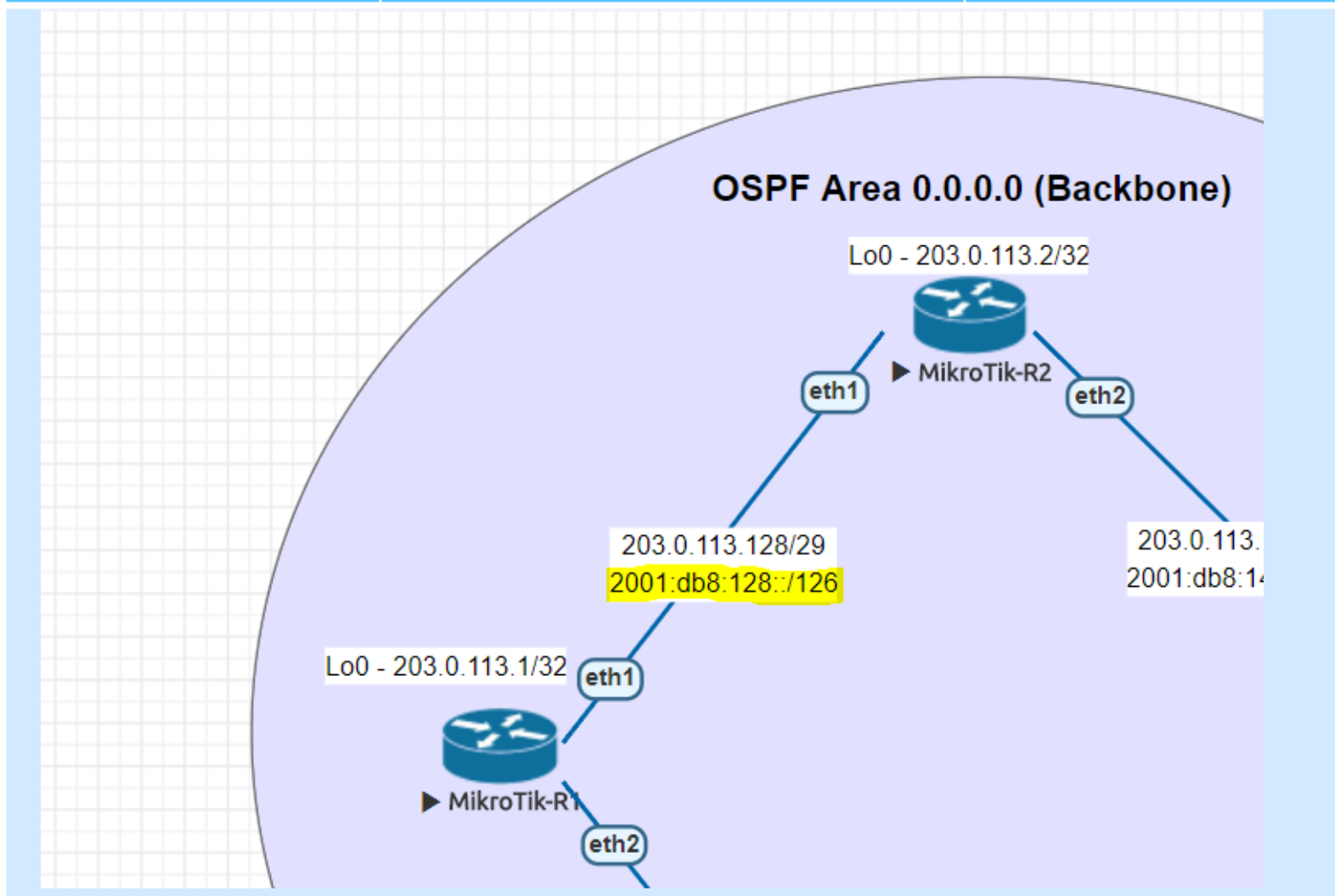
```
12:34:23 route,ospf,info Discarding Hello
packet: mismatch in hello-interval
12:34:23 route,ospf,info mine=10
12:34:23 route,ospf,info remote=20
12:34:23 route,ospf,info
source=fe80::5200:ff:fe01:0
```

Scenario 9: Area Mismatch (IPv6)

OSPFv3

Area Mismatch

R1 to R2





Operations: OSPF troubleshooting – config comparison

OSPFv3	Area Mismatch	R1 to R2
R1		
<pre>/routing ospf-v3 interface add area=backbone hello-interval=10s interface=ether1</pre>		
R2		
<pre>/routing ospf-v3 interface add area=Area51-v6 interface=ether1</pre>		
Note: IPv6 doesn't use network statements		



Operations: OSPF troubleshooting – ospf network comparison

OSPFv3

Area Mismatch

R1 to R2

R1

```
[admin@MikroTik-R1] > routing ospf-v3 interface print detail
where interface =ether1
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0    area=backbone interface=ether1 cost=10 priority=1
network-type=default retransmit-interval=5s transmit-delay=1s
hello-interval=10s dead-interval=40s instance-id=0 use-bfd=no
```

R2

```
[admin@MikroTik-R2] > routing ospf-v3 interface print detail
where interface=ether1
Flags: X - disabled, I - inactive, D - dynamic, P - passive
0    area=Area51-v6 interface=ether1 cost=10 priority=1
network-type=default retransmit-interval=5s transmit-delay=1s
hello-interval=10s dead-interval=40s instance-id=0 use-bfd=no
```




Operations: OSPF troubleshooting – log comparison

OSPFv3

Area Mismatch

R1 to R2

R1

```
12:48:32 route,ospf,debug Discarding packet: invalid area ID
12:48:32 route,ospf,debug      source=fe80::5200:ff:fe02:0
12:48:32 route,ospf,debug      mine=0.0.0.0
12:48:32 route,ospf,debug      packet's=0.0.0.51
```

NOTE: adding ospf logging is required to see this message in IPv6 – unlike IPv4

R2

```
12:53:12 route,ospf,debug Discarding packet: invalid area ID
12:53:12 route,ospf,debug      source=fe80::5200:ff:fe01:0
12:53:12 route,ospf,debug      mine=0.0.0.51
12:53:12 route,ospf,debug      packet's=0.0.0.0
```

Cisco command	MikroTik Command
show ip ospf neighbor	routing ospf neighbor print
show ip ospf interface	routing ospf interface print
show ip ospf 1	routing ospf instance print detail
show ip ospf database	routing ospf lsa print
show ip route ospf	ip route print where ospf=yes
show ip ospf rib	routing ospf route print
show ip ospf border-routers	routing ospf area-border-router print
show ip ospf border-routers	routing ospf as-border-router print
Cisco(config)#router ospf 1	/routing ospf instance
Cisco(config-router)#router-id 203.0.113.1	/routing ospf instance set o router-id=203.0.113.2
Cisco(config-router)#network 203.0.113.1 0.0.0.0 area 0	/routing ospf network add area=backbone network=203.0.113.2/32
Cisco(config-router)#network 203.0.113.128 0.0.0.7 area 0	/routing ospf network add area=backbone network=203.0.113.128/29
Cisco(config-router)#interface GigabitEthernet0/0 Cisco(config-if)# ip ospf network point-to-point Cisco(config-if)# ip ospf dead-interval 4 Cisco(config-if)# ip ospf hello-interval 1	/routing ospf interface add dead-interval=4s hello-interval=1s interface=ether1 network- type=point-to-point

Common causes of OSPF issues

- Firewall blocking OSPF
- Packet loss causing neighbors to drop
- High CPU causing routing to drop
- Bug causes OSPF to drop

Known OSPF bugs in RouterOS

- OSPFv2 - MD5 Authentication is broken
- OSPFv3 – Recursive routing
- OSPFv2 - 120 max LSAs due to fragmentation bug



Design: **Questions?**

Questions??