MikroTik

OSPF SPECIAL AREA IMPLEMENTATION

BY
ANTONIUS DUTY SUSILO

MUM VIETNAM
2019

Profile

- Antonius Duty Susilo
- Trainer And Consultant Mikrotik
- Instructor Cisco Academy and Oracle Academy (Oracle WDP)
- Ph.D Student In UTEM Malaysia (Universiti Teknikal Malaysia Melaka)
- Guest Lecturer in POLINEMA (Politeknik Negeri Malang), STIMATA (STMIK PPKIA Pradnya Paramita Malang, STIKI (Sekolah Tinggi Informatika dan Komputer Indonesia Malang)

MUM Vietnam 2018

OBJECTIVE

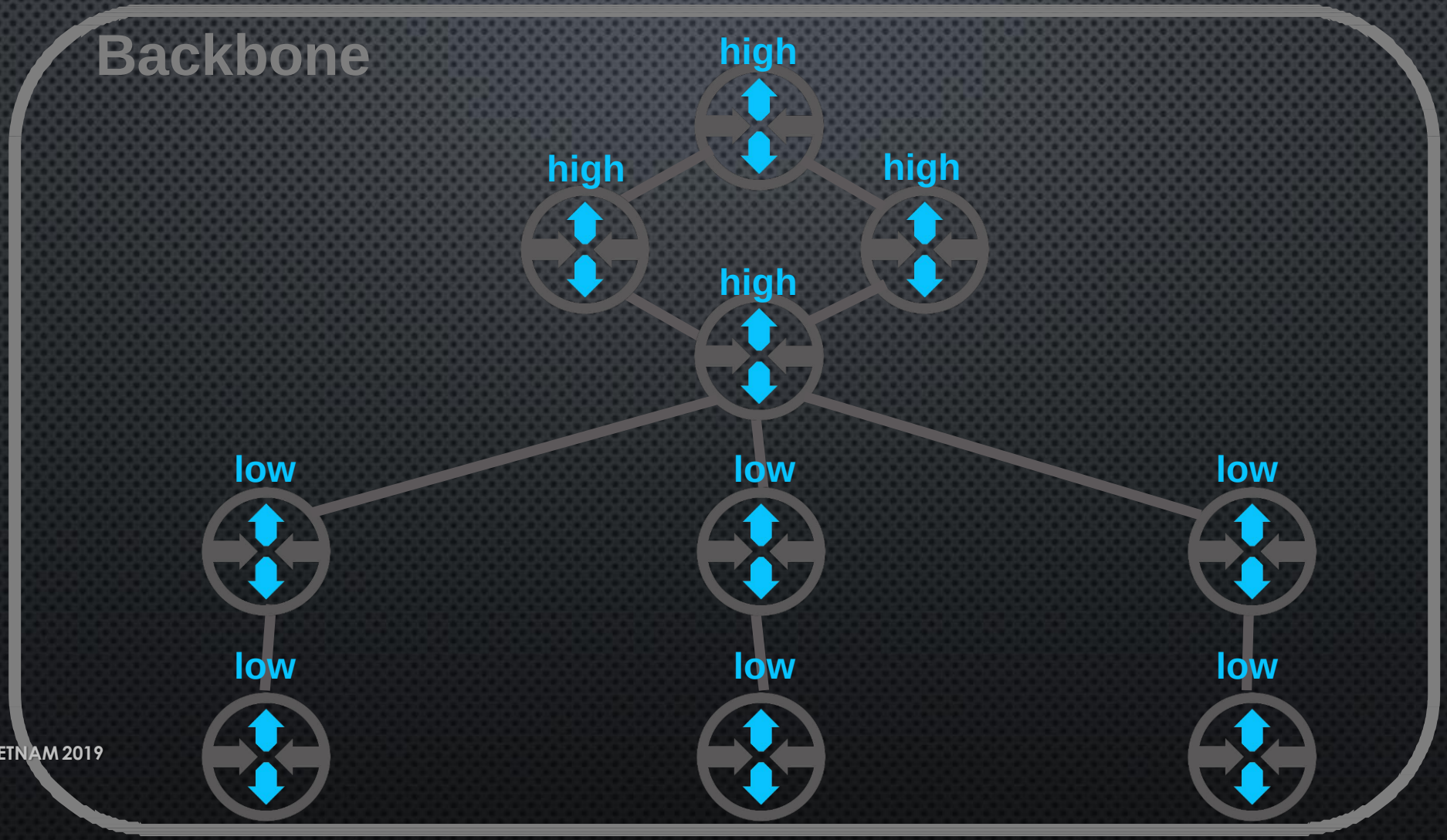
- What is OSPF?
- What is area in OSPF?
- What is LSA?
- Why we need special area?
- How special area work?
- How to configure special area OSPF?

WHAT IS OSPF?

- **Open Shortest Path First** (**OSPF**) is a routing protocol for Internet Protocol (IP) networks. It uses a link state routing (LSR) algorithm and falls into the group of interior gateway protocols (IGPs), operating within a single autonomous system (AS).

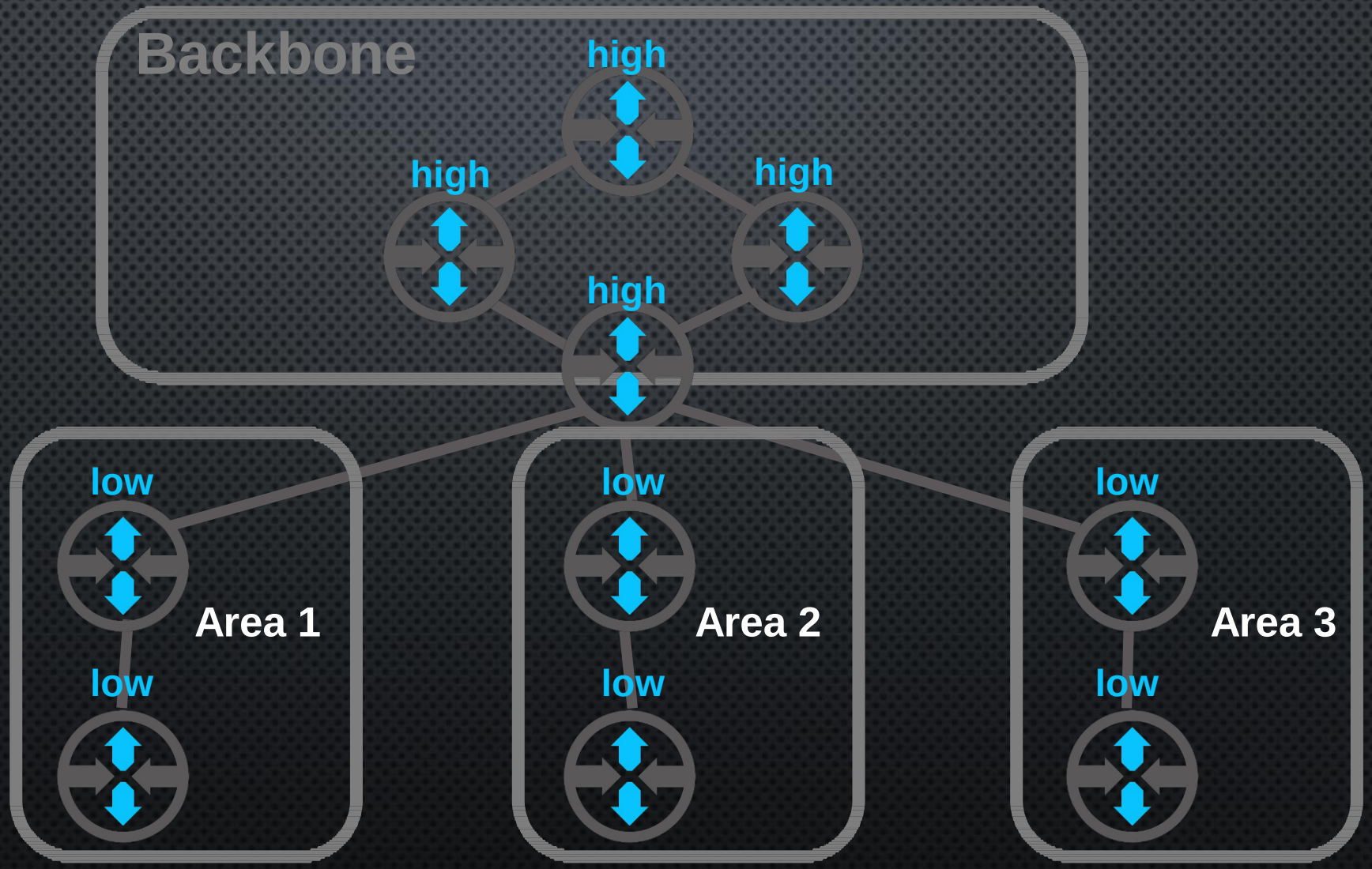
WHAT IS AREA?

- Why we need area concept?



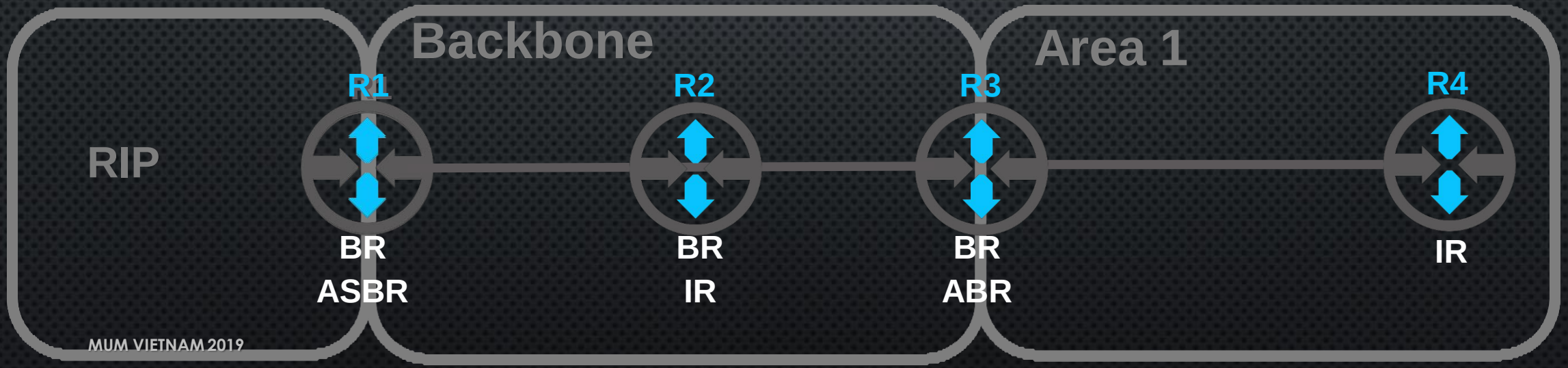
WHAT IS AREA?

- Why we need area concept?



TYPE OF OSPF ROUTER

- Internal Router (IR) -> all of interface in the same area
- Backbone Router (BR) -> at least one interface in the backbone area
- Area Border Router (ABR) -> connecting different area
- AS Boundary Router (ASBR) -> connecting ospf with external network



WHAT IS LSA (LINK STATE ADVERTISEMENT)

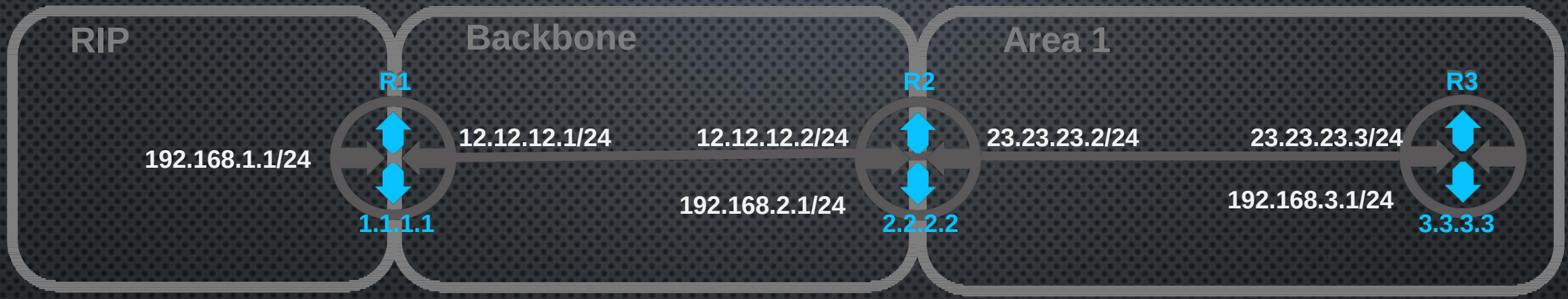
Types of LSA

LSA Type 1:	Router LSA
LSA Type 2:	Network LSA
LSA Type 3:	Summary LSA
LSA Type 4:	Summary ASBR LSA
LSA Type 5:	Autonomous system external LSA
LSA Type 6:	Multicast OSPF LSA
LSA Type 7:	Not-so-stubby area LSA
LSA Type 8:	External attribute LSA for BGP

LSA TYPE 1 (ROUTER LSA)

- Each router will create LSA Type 1
- Flood within area, not flooded to other area
- Bring the information about directly connected network
- **LSA ID** will be **router-id** of each router
- **Originator** will be **router-id** of DR

LSA TYPE 1

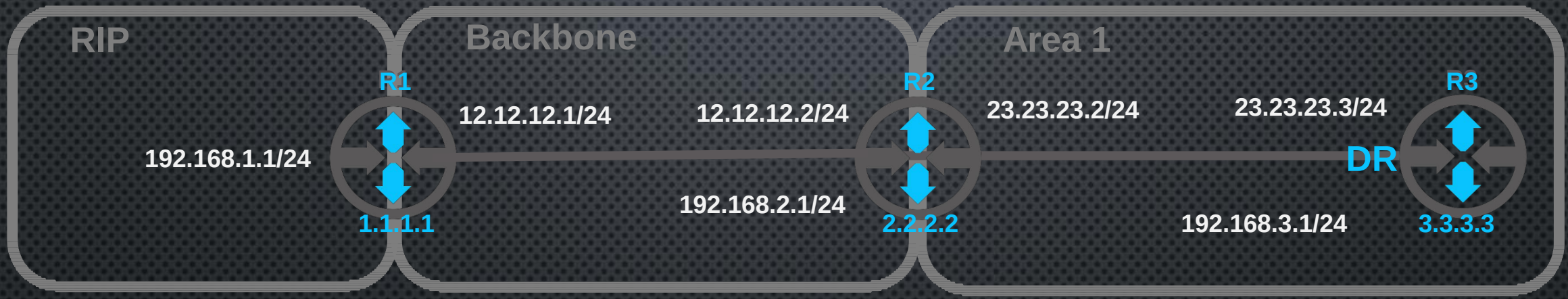


Area	LSA Type	LSA ID	Originator
Area 1	Router LSA	2.2.2.2	2.2.2.2
Area 1	Router LSA	3.3.3.3	3.3.3.3

LSA TYPE 2 (NETWORK LSA)

- Created by DR in the multi-access network
- Flood within area, not flooded to other area
- Bring the information about routers in one multiaccess network
- **LSA ID** will be IP **address** of DR
- **Originator** will be **router-id** of DR

LSA TYPE 2 (NETWORK LSA)



Area	LSA Type	LSA ID	Originator
Area 1	Network LSA	23.23.23.3	3.3.3.3

LSA TYPE 3 (SUMMARY NETWORK LSA)

- Created by ABR
- Flood to other area
- Bring the information network in the other area
- **LSA ID** will be **ip network** of network in other area
  - 12.12.12.0/24 -> 12.12.12.0
- **Originator** will be **router-id** of ABR

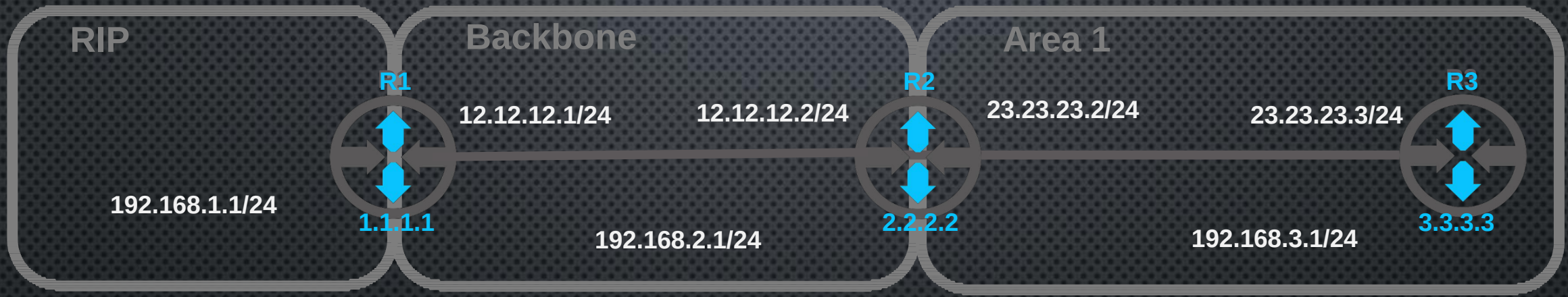
LSA TYPE 3 (SUMMARY NETWORK LSA)

Area	LSA Type	LSA ID	Originator
Area 1	Summary Network LSA	12.12.12.0	2.2.2.2
Area 1	Summary Network LSA	192.168.2.0	2.2.2.2
Area 1	Summary Network LSA	1.1.1.1	2.2.2.2
Area 1	Summary Network LSA	2.2.2.2	2.2.2.2

LSA TYPE 4 (SUMMARY ASBR LSA)

- Created by Area Border Router
- Flood to other area
- Bring the information about ASBR
- **LSA ID** will be **router id** of ASBR
- **Originator** will be **router-id** of ABR

LSA TYPE 4 (SUMMARY ASBR LSA)

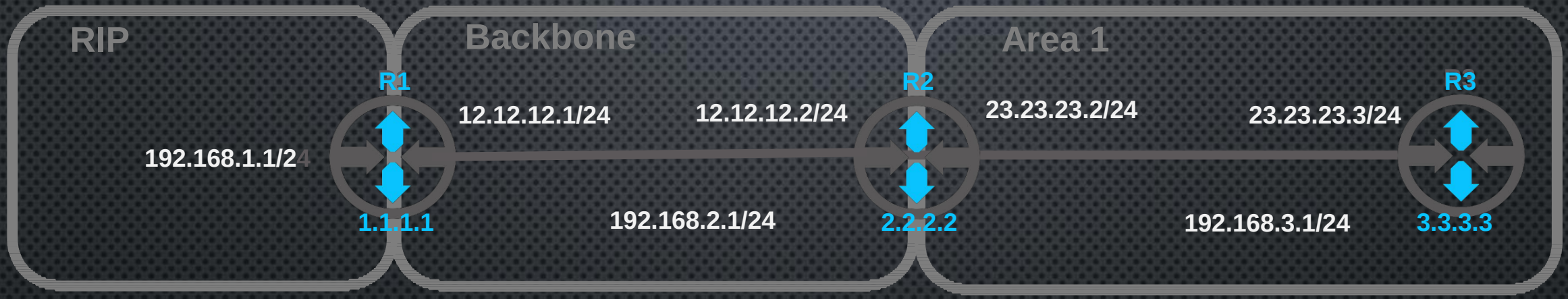


Area	LSA Type	LSA ID	Originator
Area 1	Summary ASBR	1.1.1.1	2.2.2.2

LSA TYPE 5 (AS EXTERNAL LSA)

- Created by Autonomous System Boundary Router
- Bring the information about network in the external network
- **LSA ID** will be **ip network** of network in external
  - 192.168.1.0/24 -> 192.168.1.0
- **Originator** will be **router-id** of ASBR

LSA TYPE 5 (AS EXTERNAL LSA)



Area	LSA Type	LSA ID	Originator
Area 1	AS External	192.168.1.0	1.1.1.1

OSPF ROUTES

- **Intra Area Route**

  -> The network is in the same area, created by LSA Type 1

- **Inter Area Route**

  -> The network is in the other area, created by LSA Type 3

- **External Route**

  -> The network is in the external network, created by LSA Type 5

OSPF SPECIAL AREA

- Stub Area
- Totally Stub Area

STUB AREA

Stub Area in OSPF routing is an area that cannot be travers to network using another segment, meaning this area is the most end area and there are no more branches.

The Stub area has the characteristics of not receiving LSA type 4 and type 5 packet . It means that this type of area does not accept LSA packets originating from other areas delivered by the ABR router and does not receive LSA packages from other routing protocols coming out of the ASBR router (LSA types 4 and 5)

STUB AREA

- This router only receives information from other routers in one area
- The Stub area communicates with outside networks using ***default route*** that will be tasked with receiving and forwarding all information that wants to exit the area.

TOTALLY STUB AREA

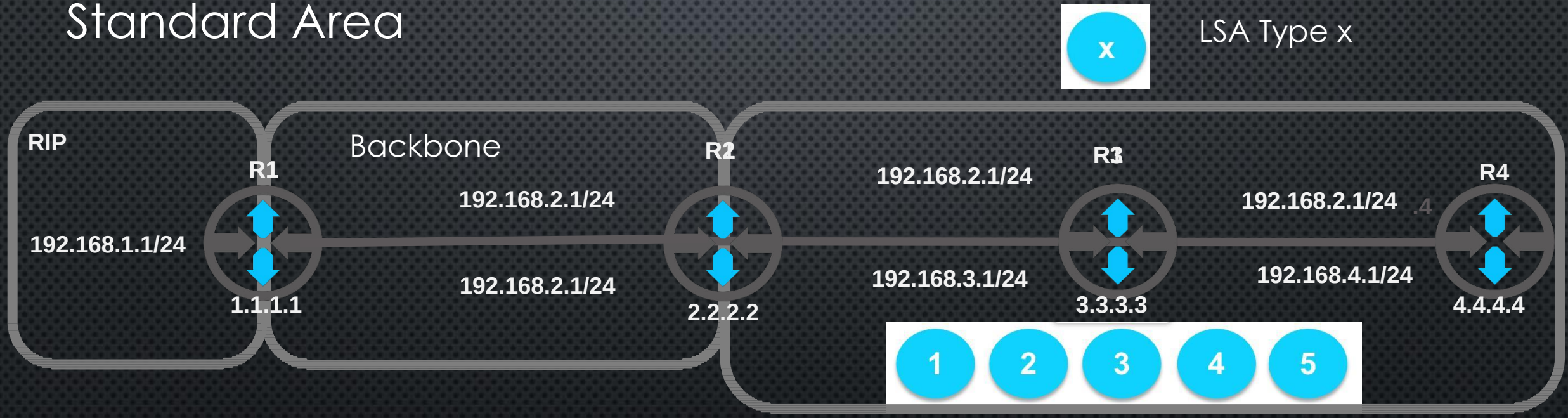
- The difference between the routing type stub area and totally stub area is that if the stub area type received is type 1, 2, and 3 but the totally stub area is more specific, type 1 and type 2 only.

PURPOSE OF SPECIAL AREA

The purpose of an area used as a stub area is to reduce the LSDB entry on each Router in this stub area because the Router does not receive information from outside OSPF or outside the OSPF stub area, so the Router workload in this area becomes lighter, and also calculations

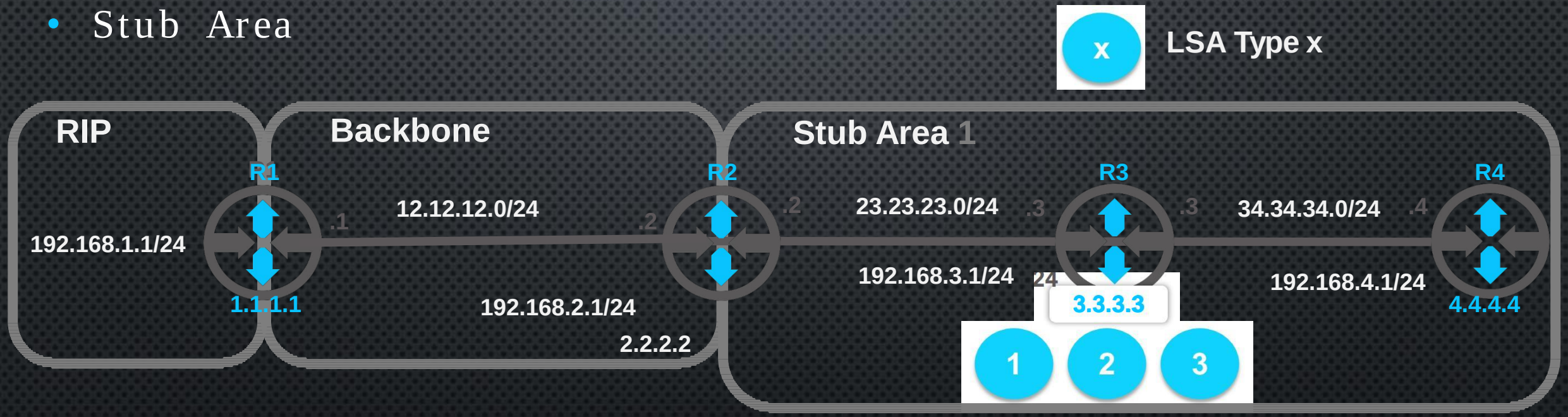
WHY SPECIAL AREA?

Standard Area



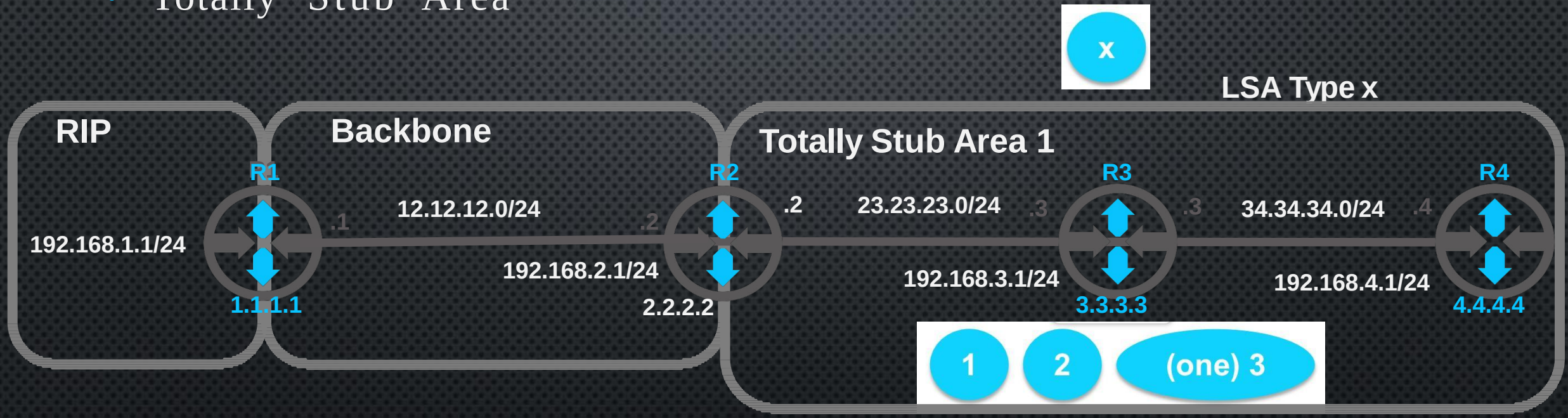
WHY SPECIAL AREA?

- Stub Area



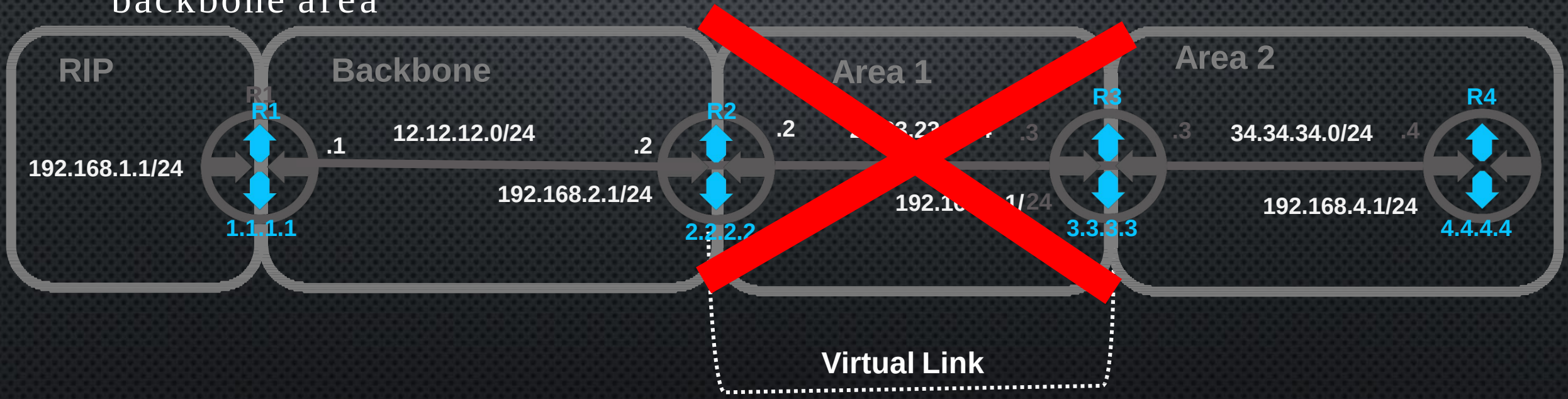
WHY SPECIAL AREA?

- Totally Stub Area

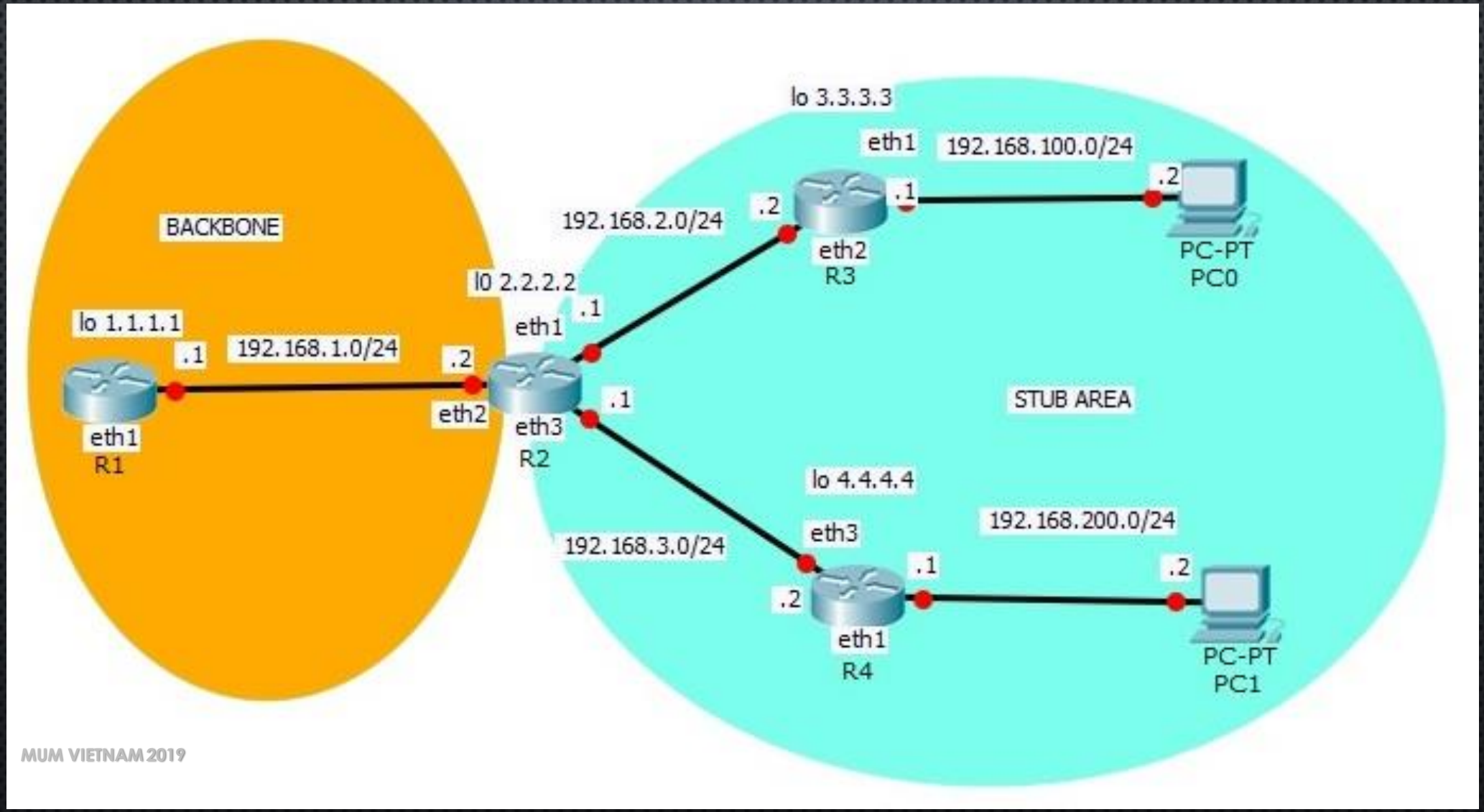


WHEN WE MUST USE STUB/TOTALLY

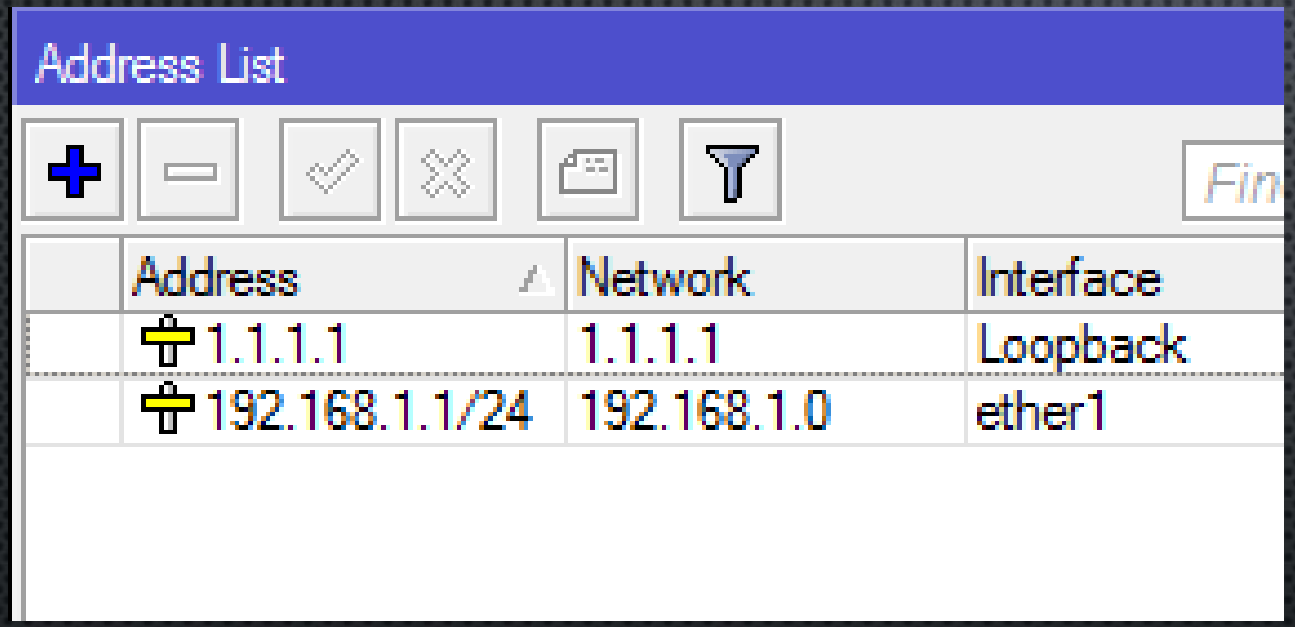
- When we have many routers in our network
- When our router has low resource of CPU, Memory
- When our area is not transit area
- We will never be able to configure stub area in the backbone area

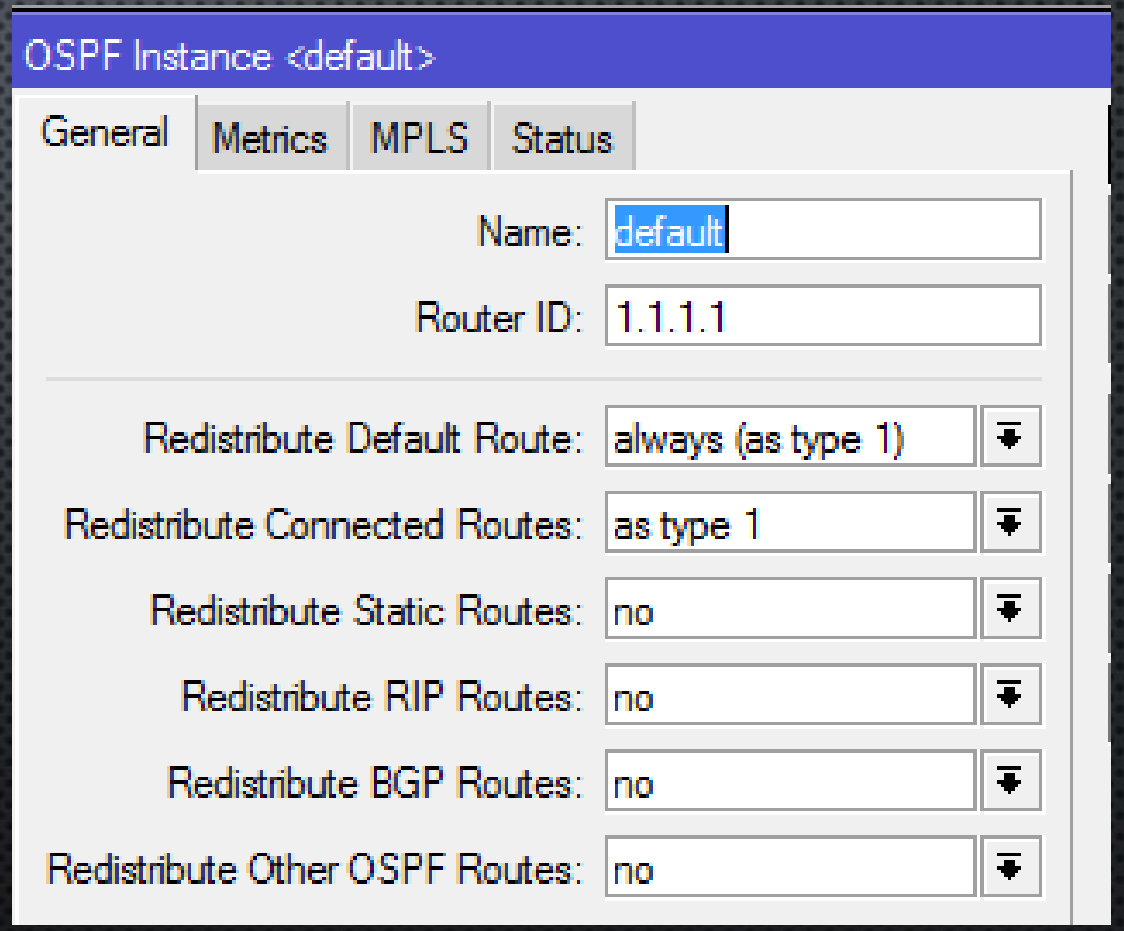


LAB

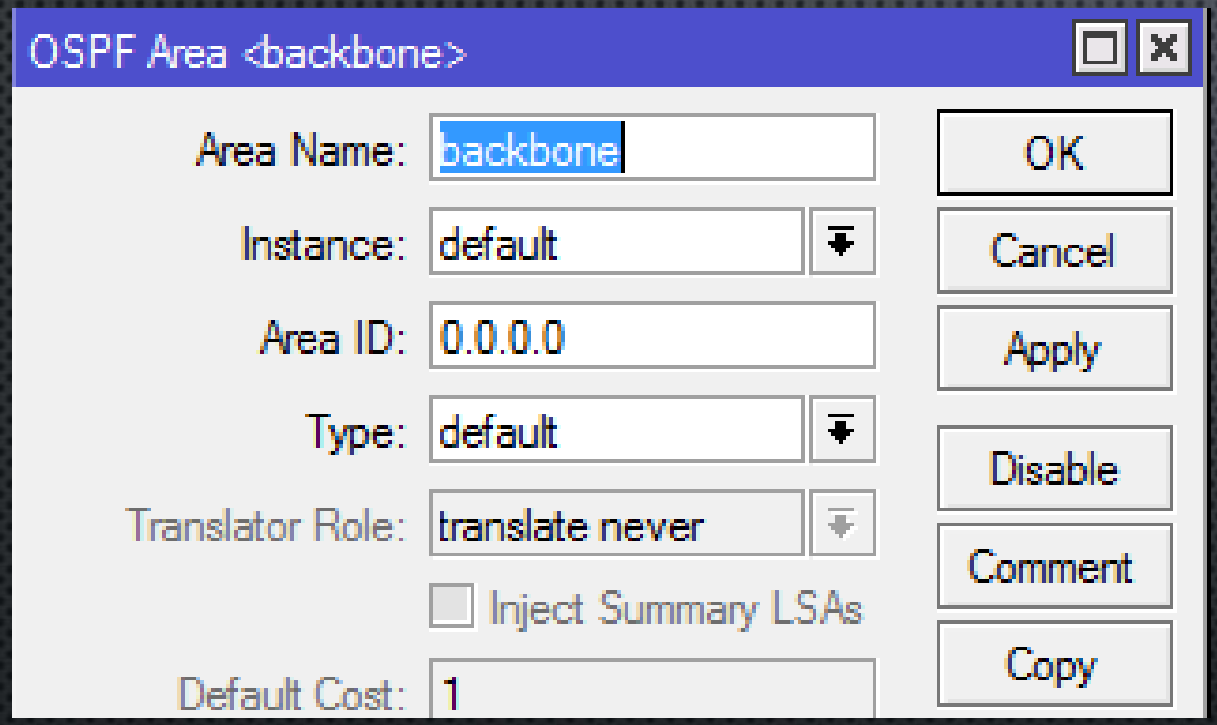

BACKBONE
lo 1.1.1.1
.1
192.168.1.0/24
.2
eth1
R1
eth2
lo 2.2.2.2
.1
eth1
192.168.2.0/24
.2
eth2
R3
lo 3.3.3.3
eth1
192.168.100.0/24
.1
.2
PC-PT
PC0
.1
eth3
R2
.1
STUB AREA
lo 4.4.4.4
192.168.3.0/24
eth3
.1
.2
eth1
R4
192.168.200.0/24
.2
PC-PT
PC1

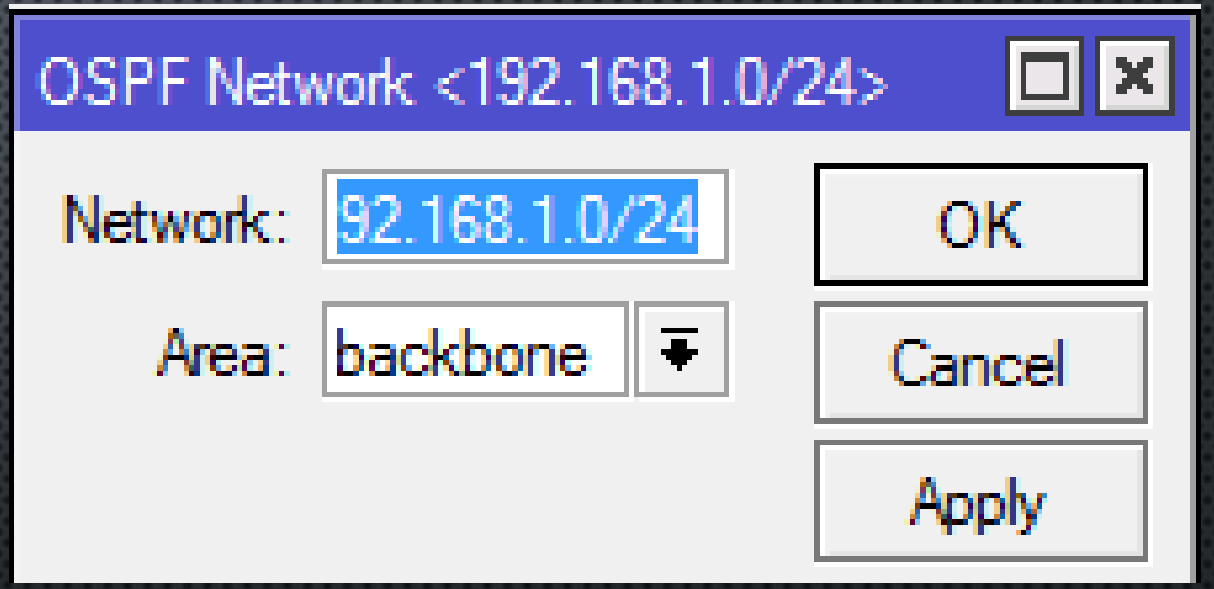
ROUTER 1 AS BACKBONE



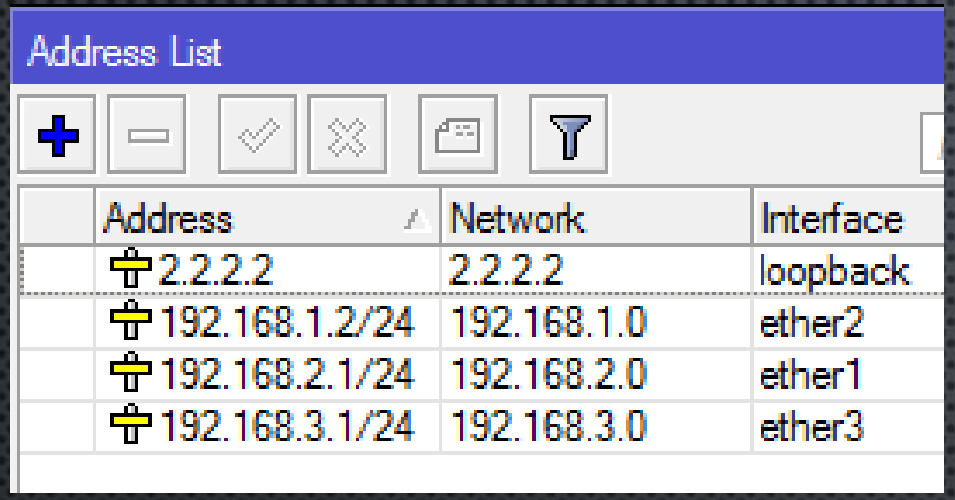


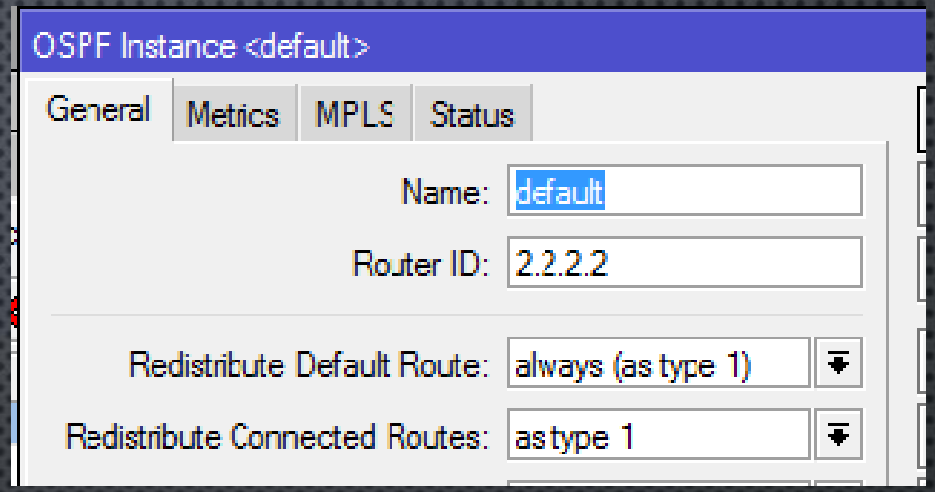
ROUTER 1 AS BACKBONE

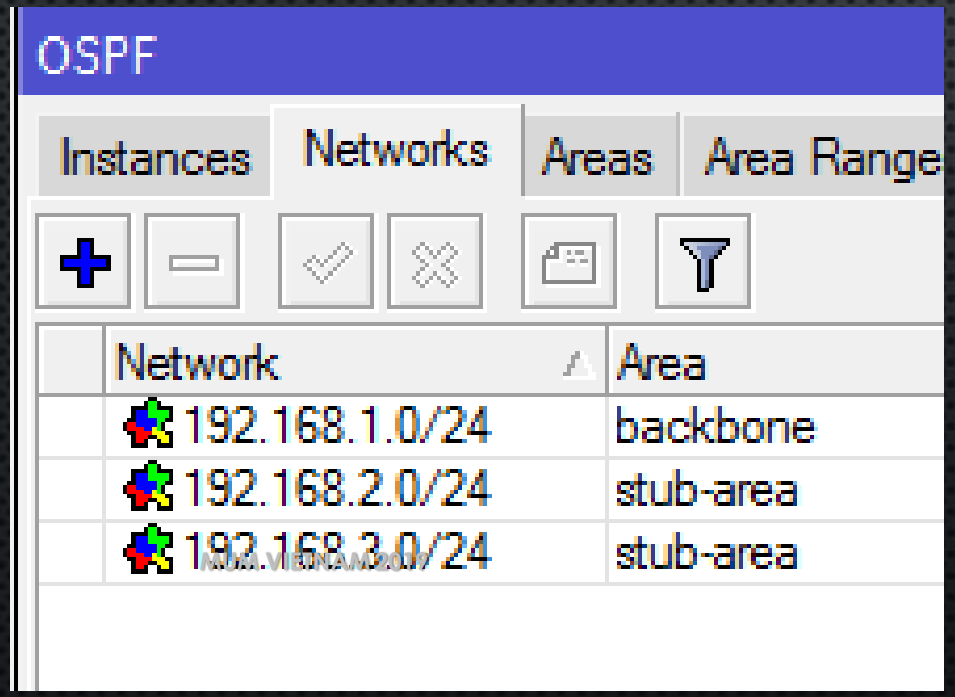




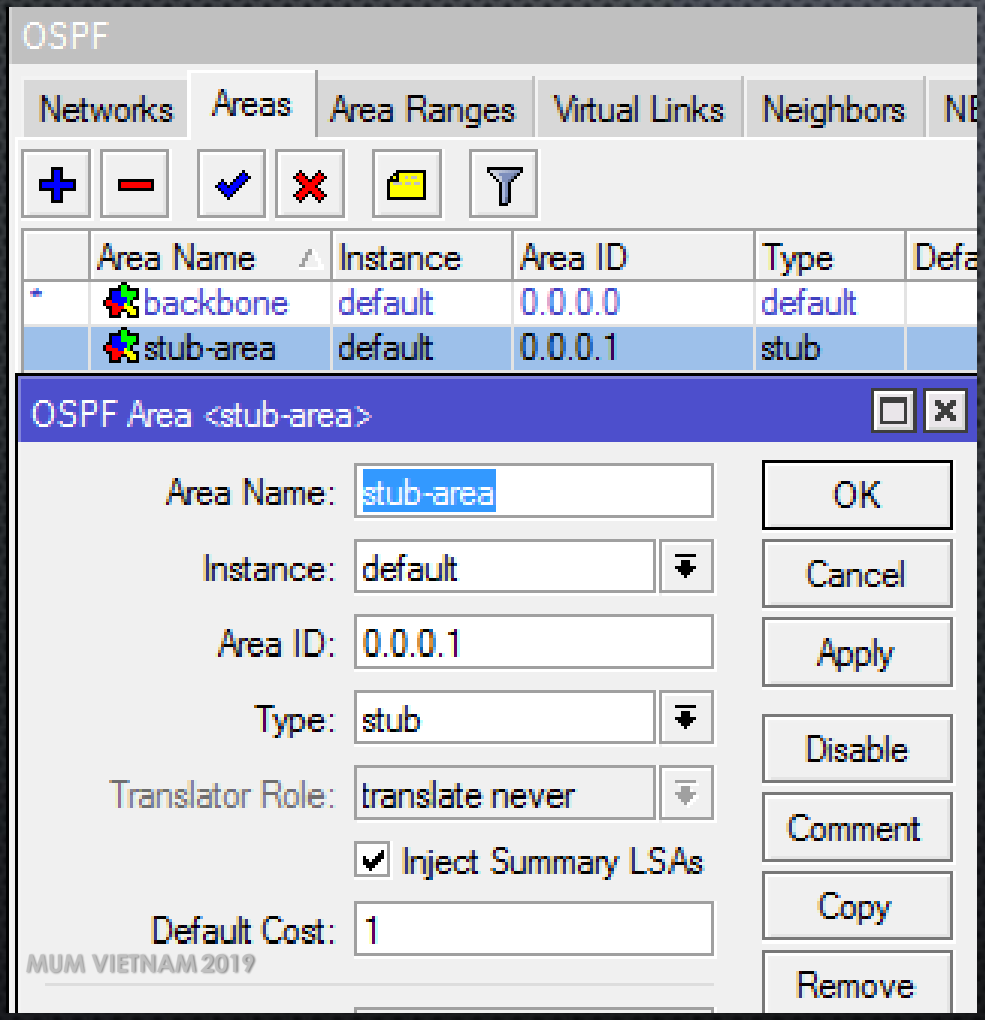
ROUTER 2


Address List
Address
Network
Interface
2.2.2.2
2.2.2.2
loopback
192.168.1.2/24
192.168.1.0
ether2
192.168.2.1/24
192.168.2.0
ether1
192.168.3.1/24
192.168.3.0
ether3

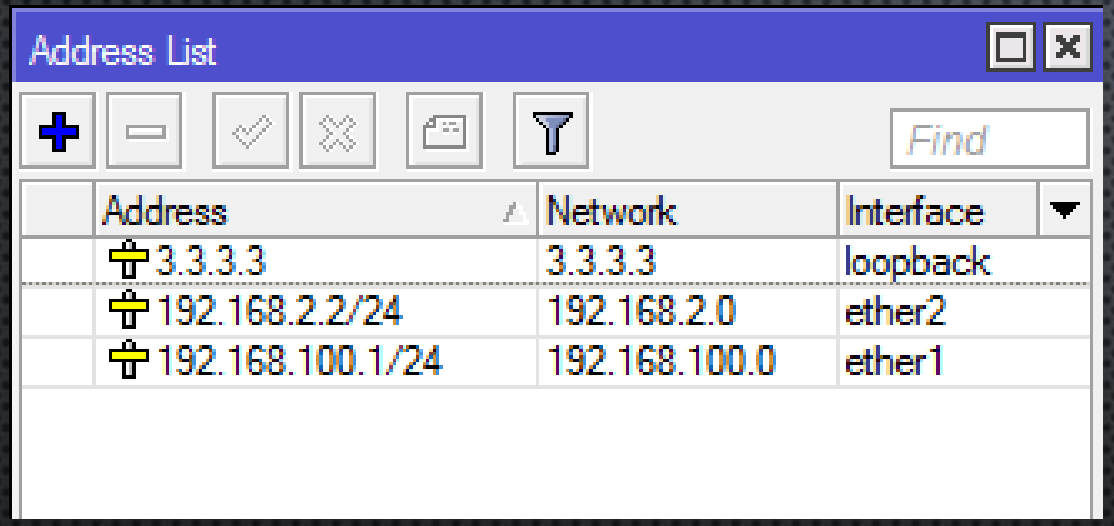

OSPF Instance <default>
General
Metrics
MPLS
Status
Name:
default
Router ID:
2.2.2.2
Redistribute Default Route:
always (as type 1)
Redistribute Connected Routes:
as type 1

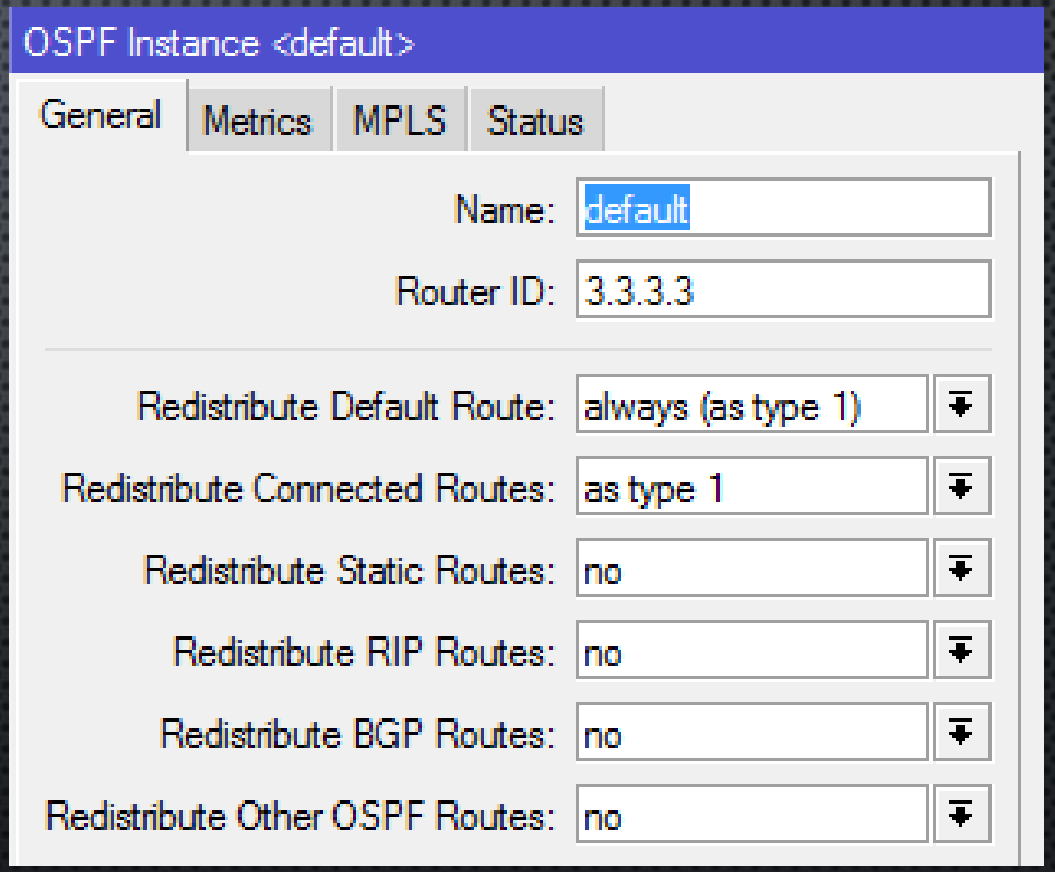

OSPF
Instances
Networks
Areas
Area Range
Network
Area
192.168.1.0/24
backbone
192.168.2.0/24
stub-area
192.168.3.0/24
stub-area

ROUTER 2

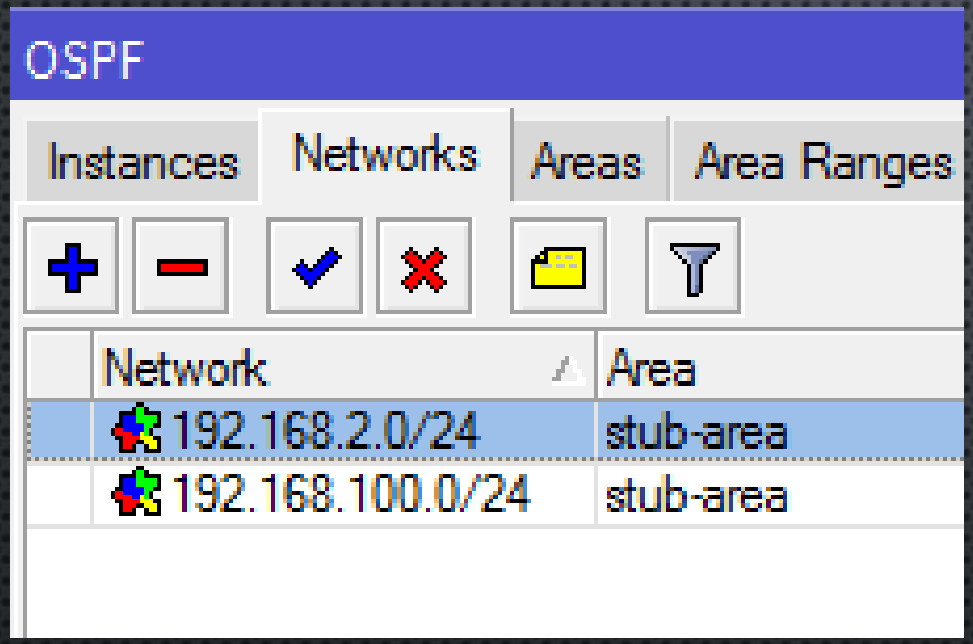

OSPF
Networks
Areas
Area Ranges
Virtual Links
Neighbors
Area Name
Instance
Area ID
Type
backbone
default
0.0.0.0
default
stub-area
default
0.0.0.1
stub
OSPF Area <stub-area>
Area Name:
stub-area
Instance:
default
Area ID:
0.0.0.1
Type:
stub
Translator Role:
translate never
Inject Summary LSAs
Default Cost:
1
OK
Cancel
Apply
Disable
Comment
Copy
Remove
MUM VIETNAM 2019

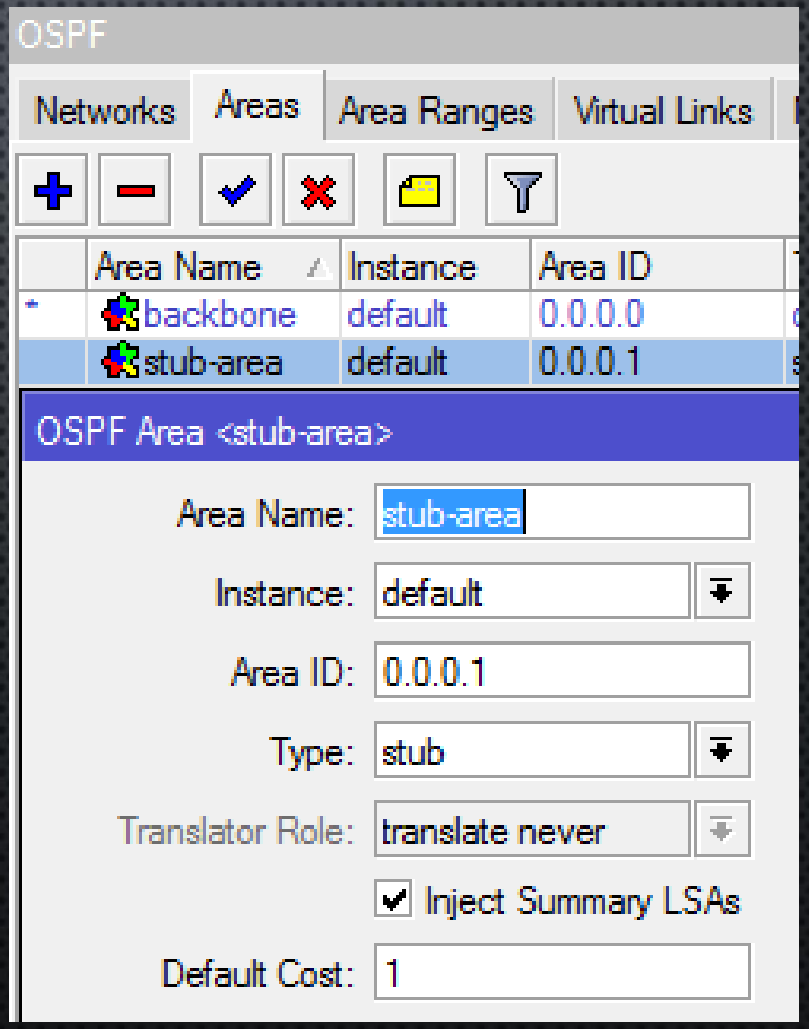
ROUTER 3


Address List
Find
Address
Network
Interface
3.3.3.3
3.3.3.3
loopback
192.168.2.2/24
192.168.2.0
ether2
192.168.100.1/24
192.168.100.0
ether1

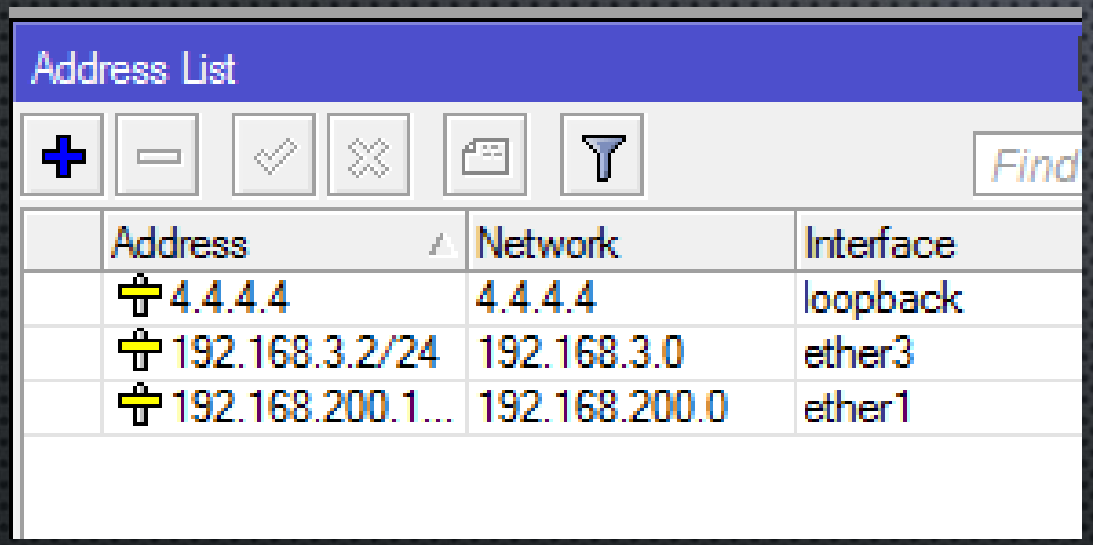

OSPF Instance <default>
General
Metrics
MPLS
Status
Name:
default
Router ID:
3.3.3.3
Redistribute Default Route:
always (as type 1)
Redistribute Connected Routes:
as type 1
Redistribute Static Routes:
no
Redistribute RIP Routes:
no
Redistribute BGP Routes:
no
Redistribute Other OSPF Routes:
no

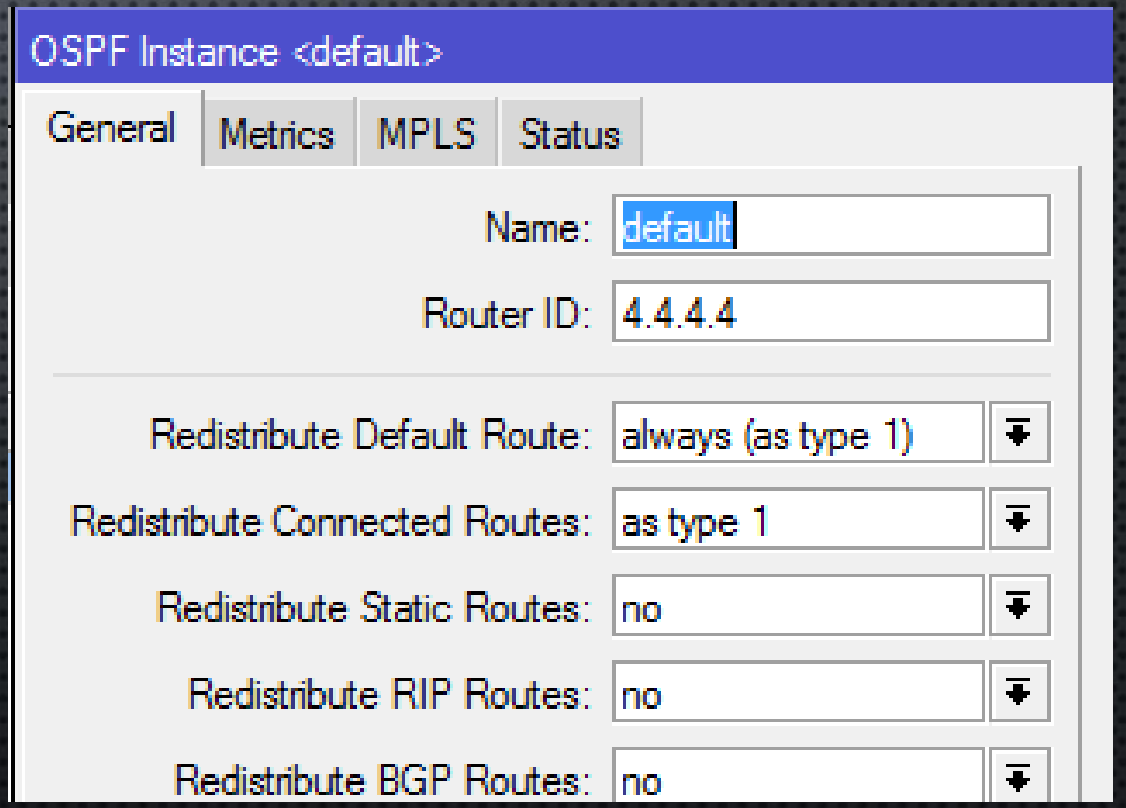
ROUTER 3


OSPF
Instances
Networks
Areas
Area Ranges
Network
Area
192.168.2.0/24
stub-area
192.168.100.0/24
stub-area

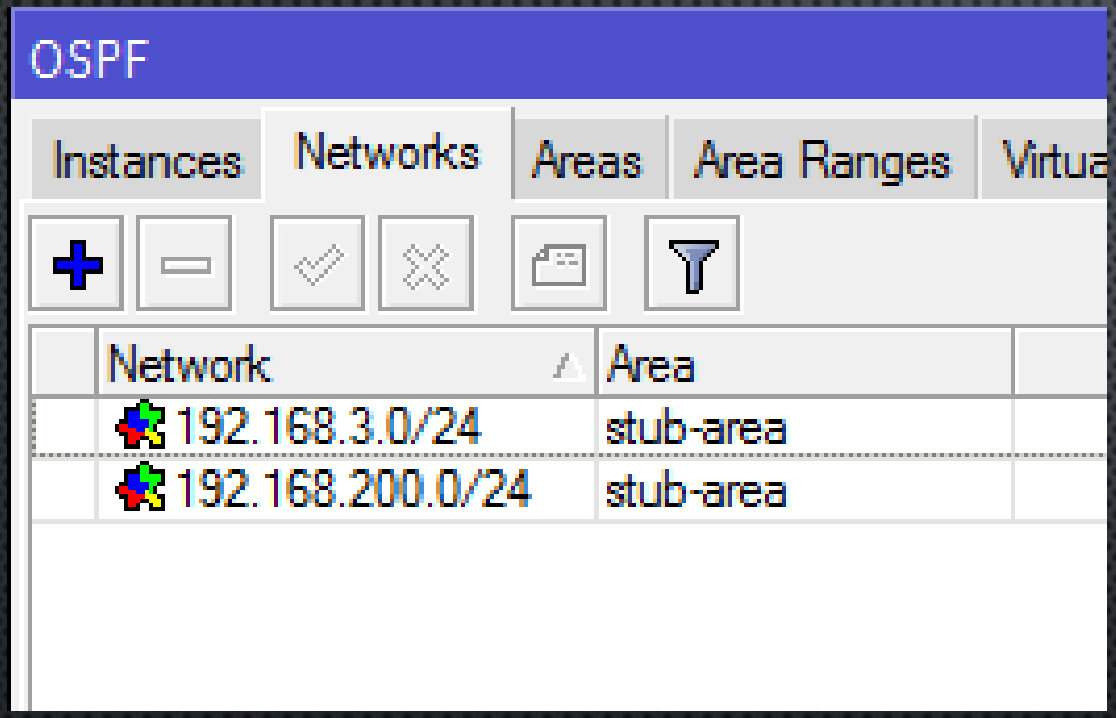

OSPF
Networks
Areas
Area Ranges
Virtual Links
Area Name
Instance
Area ID
backbone
default
0.0.0.0
stub-area
default
0.0.0.1
OSPF Area <stub-area>
Area Name:
stub-area
Instance:
default
Area ID:
0.0.0.1
Type:
stub
Translator Role:
translate never
Inject Summary LSAs
Default Cost:
1

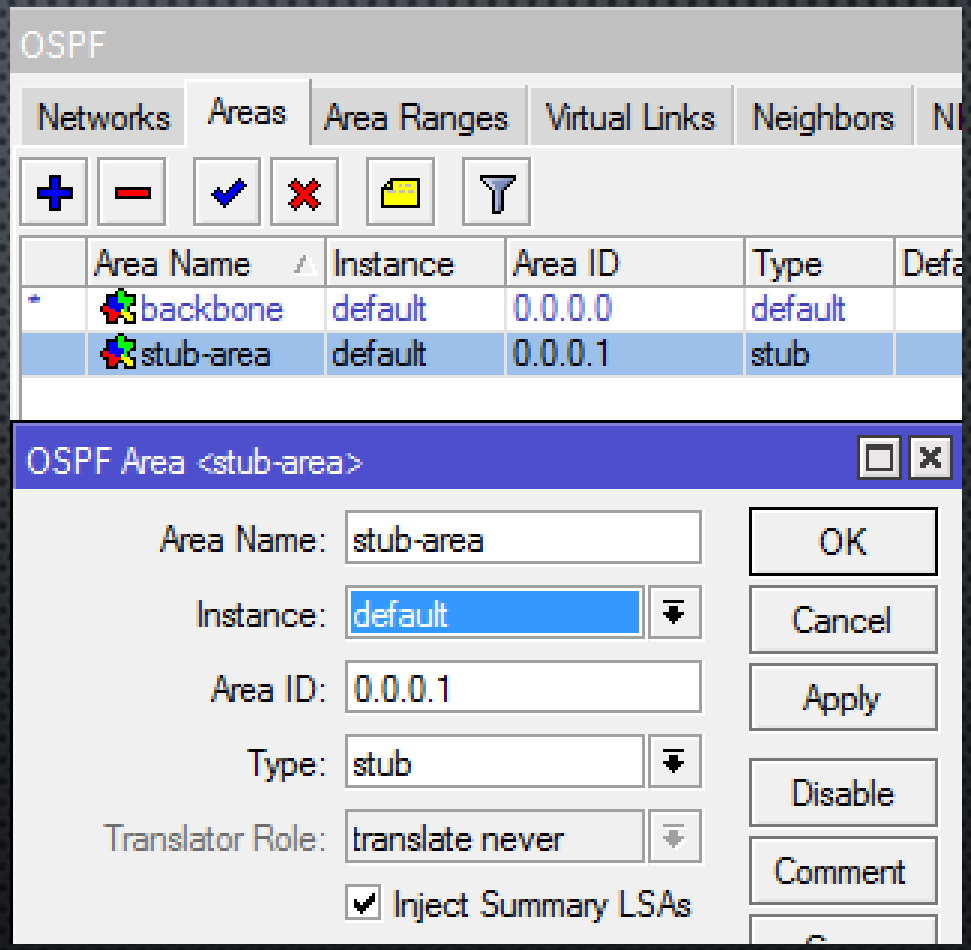
ROUTER 4


Address List
Find
Address
Network
Interface
4.4.4.4
4.4.4.4
loopback
192.168.3.2/24
192.168.3.0
ether3
192.168.200.1...
192.168.200.0
ether1


OSPF Instance <default>
General
Metrics
MPLS
Status
Name:
default
Router ID:
4.4.4.4
Redistribute Default Route:
always (as type 1)
Redistribute Connected Routes:
as type 1
Redistribute Static Routes:
no
Redistribute RIP Routes:
no
Redistribute BGP Routes:
no

ROUTER 4


OSPF
Instances
Networks
Areas
Area Ranges
Virtua
Network
Area
192.168.3.0/24
stub-area
192.168.200.0/24
stub-area


OSPF
Networks
Areas
Area Ranges
Virtual Links
Neighbors
Area Name
Instance
Area ID
Type
backbone
default
0.0.0.0
default
stub-area
default
0.0.0.1
stub
OSPF Area <stub-area>
Area Name:
stub-area
Instance:
default
Area ID:
0.0.0.1
Type:
stub
Translator Role:
translate never
Inject Summary LSAs
OK
Cancel
Apply
Disable
Comment

RESULT FROM R4 TO R1 AND R3 (PC HOST)

```
[admin@R4] > ping 192.168.1.1
  SEQ HOST                                     SIZE TTL TIME   STATUS
    0 192.168.1.1                                56  63 1ms
    1 192.168.1.1                                56  63 0ms
    sent=2 received=2 packet-loss=0% min-rtt=0ms avg-rtt=0ms max-rtt=1ms

[admin@R4] > ping 192.168.100.1
  SEQ HOST                                     SIZE TTL TIME   STATUS
    0 192.168.100.1                              56  63 0ms
    1 192.168.100.1                              56  63 0ms
    sent=2 received=2 packet-loss=0% min-rtt=0ms avg-rtt=0ms max-rtt=0ms

[admin@R4] > ping 192.168.200.1
  SEQ HOST                                     SIZE TTL TIME   STATUS
    0 192.168.200.1                              56  64 0ms
    1 192.168.200.1                              56  64 0ms
    sent=2 received=2 packet-loss=0% min-rtt=0ms avg-rtt=0ms max-rtt=0ms
```

R2

Type 3

Type 1

Type 2

Default route

Type 5

```
[admin@R2] > routing ospf lsa print
AREA        TYPE         ID              ORIGINATOR      SEQUENCE-NUMBER   AGE
backbone    router       1.1.1.1         1.1.1.1               0x80000003   347
backbone    router       2.2.2.2         2.2.2.2               0x80000003   346
backbone    network      192.168.1.2     2.2.2.2               0x80000002   346
backbone    summary-n... 192.168.2.0     2.2.2.2               0x80000002   386
backbone    summary-n... 192.168.3.0     2.2.2.2               0x80000001   358
backbone    summary-n... 192.168.100.0   2.2.2.2               0x80000001     4
backbone    summary-n... 192.168.200.0   2.2.2.2               0x80000001     4
stub-area   router       2.2.2.2         2.2.2.2               0x8000000D   369
stub-area   router       3.3.3.3         3.3.3.3               0x80000007     6
stub-area   router       4.4.4.4         4.4.4.4               0x80000007     5
stub-area   network      192.168.2.2     3.3.3.3               0x80000002   368
stub-area   network      192.168.3.2     4.4.4.4               0x80000002   370
stub-area   summary-n... 0.0.0.0         2.2.2.2               0x80000002   386
stub-area   summary-n... 192.168.1.0     2.2.2.2               0x80000002   385
external    as-external  0.0.0.0         1.1.1.1               0x80000002   387
external    as-external  0.0.0.0         2.2.2.2               0x80000002   428
external    as-external  1.1.1.1         1.1.1.1               0x80000002   387
external    as-external  2.2.2.2         2.2.2.2               0x80000002   428
```

R3

Type 1

Type 2

Default Route

Type 3

```
[admin@R3] > routing ospf lsa print
AREA          TYPE           ID              ORIGINATOR
stub-area     router         2.2.2.2         2.2.2.2
stub-area     router         3.3.3.3         3.3.3.3
stub-area     router         4.4.4.4         4.4.4.4
stub-area     network        192.168.2.2     3.3.3.3
stub-area     network        192.168.3.2     4.4.4.4
stub-area     summary-n...   0.0.0.0         2.2.2.2
stub-area     summary-n...   192.168.1.0     2.2.2.2
[admin@R3] >
```

R4

Type 1

Type 2

Default Route

Type 3

```
[admin@R4] > routing ospf lsa print
AREA            TYPE            ID              ORIGINATOR
stub-area       router          2.2.2.2         2.2.2.2
stub-area       router          3.3.3.3         3.3.3.3
stub-area       router          4.4.4.4         4.4.4.4
stub-area       network         192.168.2.2     3.3.3.3
stub-area       network         192.168.3.2     4.4.4.4
stub-area       summary-n...    0.0.0.0         2.2.2.2
stub-area       summary-n...    192.168.1.0     2.2.2.2
[admin@R4] >
```

CONCLUSION

OSPF Special Area stub , so the Router workload in this area becomes lighter


MikroTik
THANK YOU
Hp : + 62 85102077829
Email :dutymlg@gmail.com
MUM VIETNAM 2019