# Common MikroTik OSPF mistakes

## and how to avoid them

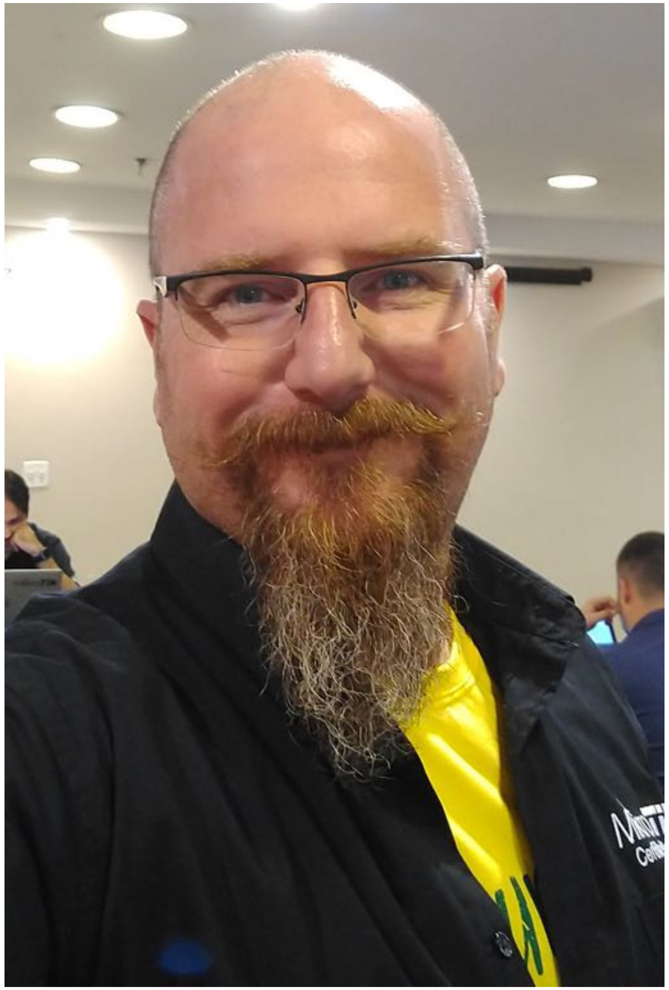
[Part 1]

By Lorenzo Busatti

# About me

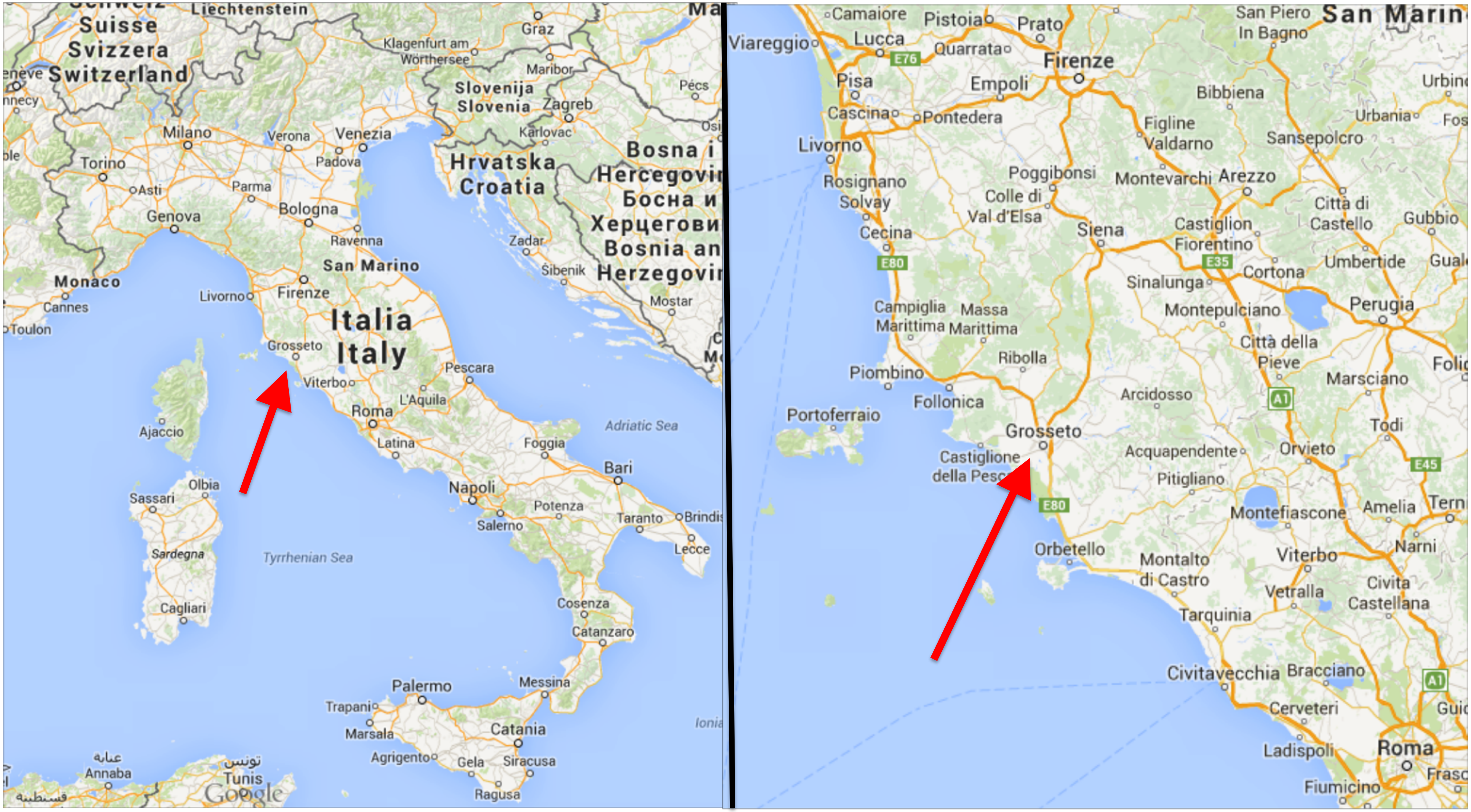
## Lorenzo Busatti

- Founder of Grifonline S.r.l. [ISP] 1997
- A user of MikroTik since 2006
- Founder of Linkwave [WISP] 2006
- MikroTik Trainer 2010
- Member of RIPE, AMS-IX, MIX-IT



20
1997
2017
20 ANNI DI INTERNET
linkwave®

# About me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# About me

Founder (2016) of the

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# About me

One of the founders (2017) of the Riga Bootcamp!

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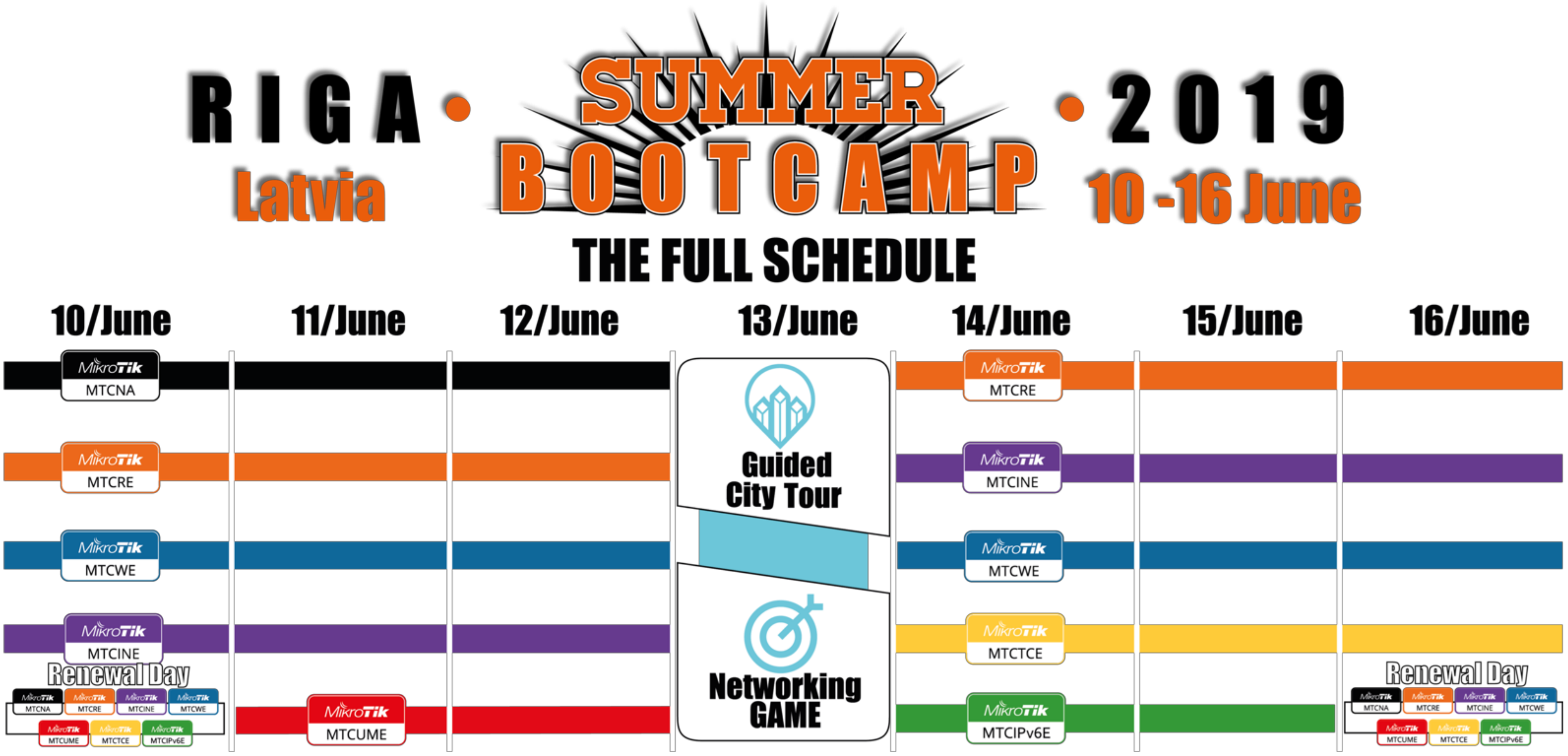
# The Schedule



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10 -16 June

THE FULL SCHEDULE

| 10/June | 11/June | 12/June | 13/June | 14/June | 15/June | 16/June |
|---|---|---|---|---|---|---|
| MTCNA | | | Guided City Tour | MTCRE | | |
| MTCRE | | | | MTCINE | | |
| MTCWE | | | | MTCWE | | |
| MTCINE | | | Networking GAME | MTCTCE | | |
| Renewal Day<br>MTCNA MTCRE MTCINE MTCWE<br>MTCUME MTCTCE MTCIPv6E | MTCUME | | | MTCIPv6E | | Renewal Day<br>MTCNA MTCRE MTCINE MTCWE<br>MTCUME MTCTCE MTCIPv6E |

*Dedicated to Max*

# Abstract

Installing and configuring OSPF is about understanding more than just how to configure RouterOS.

Avoiding common mistakes and assumptions made when deploying OSPF with RouterOS, leads to a higher quality of installation.

We will be covering some of the pitfalls we've seen and show how to avoid them.

# Abstract

Delivering MTCRE and MTCINE Training Classes makes me aware of the lack of knowledge of the protocol and many misunderstandings by most of the technicians.

# Abstract

The points we will focus on today:

- **OSPF basics**
- **Common OSPF mistakes**
- **OSPF <u>Extra</u> tips**

# The OSPF protocol

## **O**pen **S**hortest **P**ath **F**irst

OSPF calculates the **shortest route** to a destination through the network based on the **Dijkstra's algorithm**.

If the network topology **changes** then the routing tables will also be **recalculated again**.

# The OSPF protocol

## **O**pen **S**hortest **P**ath **F**irst

- Is a routing protocol for IP networks.
- It uses a link state routing (LSR) algorithm.
- It falls into the group of IGPs (interior gateway protocols).
- Is within a single AS (autonomous system).
- It is defined as OSPF Version 2 for IPv4.
- The updates for IPv6 are specified as OSPF Version 3.

# The Dijkstra's algorithm

- Also known as the "**shortest path first (SPF)**"

- Is an algorithm for **finding the shortest paths between nodes** in a graph (an abstract data type)

# The Dijkstra's Algorithm

**Shortest path**

↓ means ↓

the "**cheapest**" path

↓ means ↓

The **sum** of the cost of the **output** interface of **each router** for **the full path**

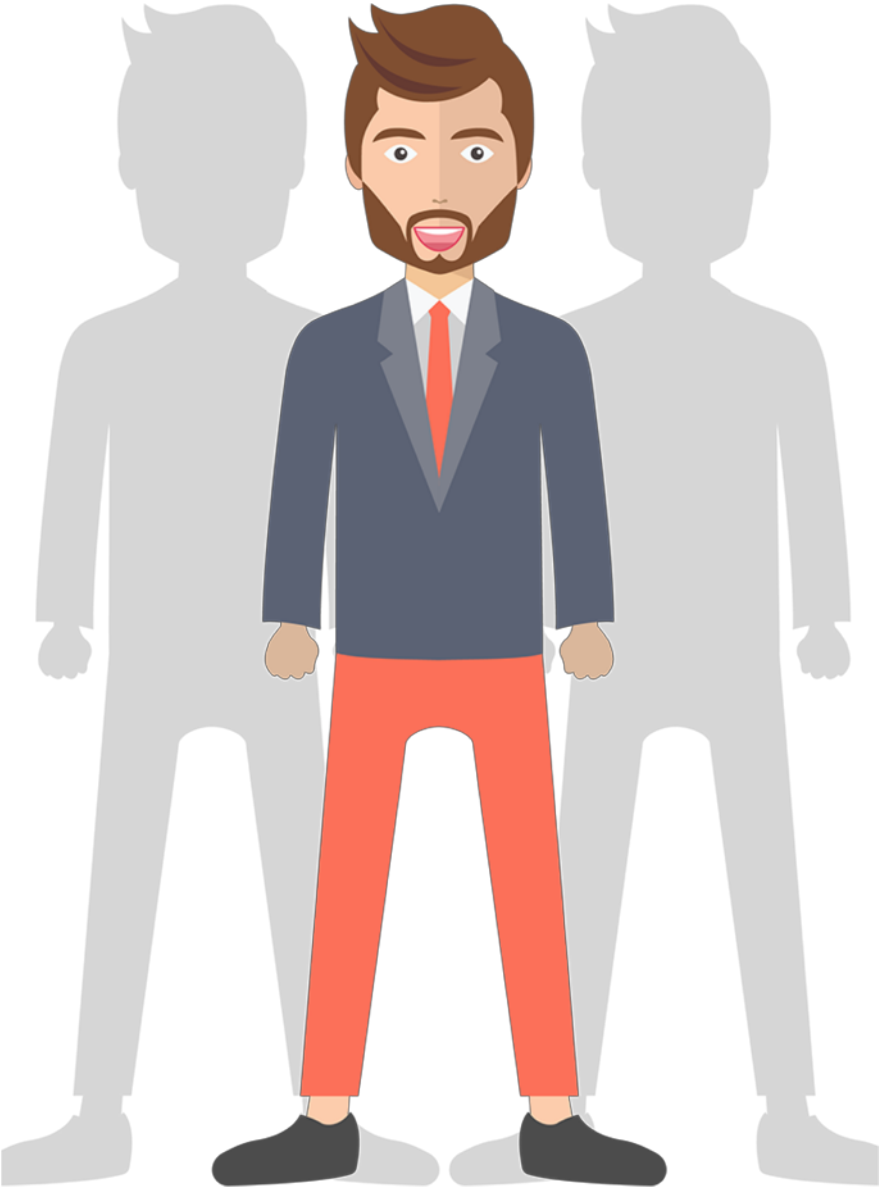
# OSPF Basics

It’s quite easy to implement the OSPF protocol in a network:

1) Put ip addresses in the same subnet between the routers;
2) Paste this code in each one:

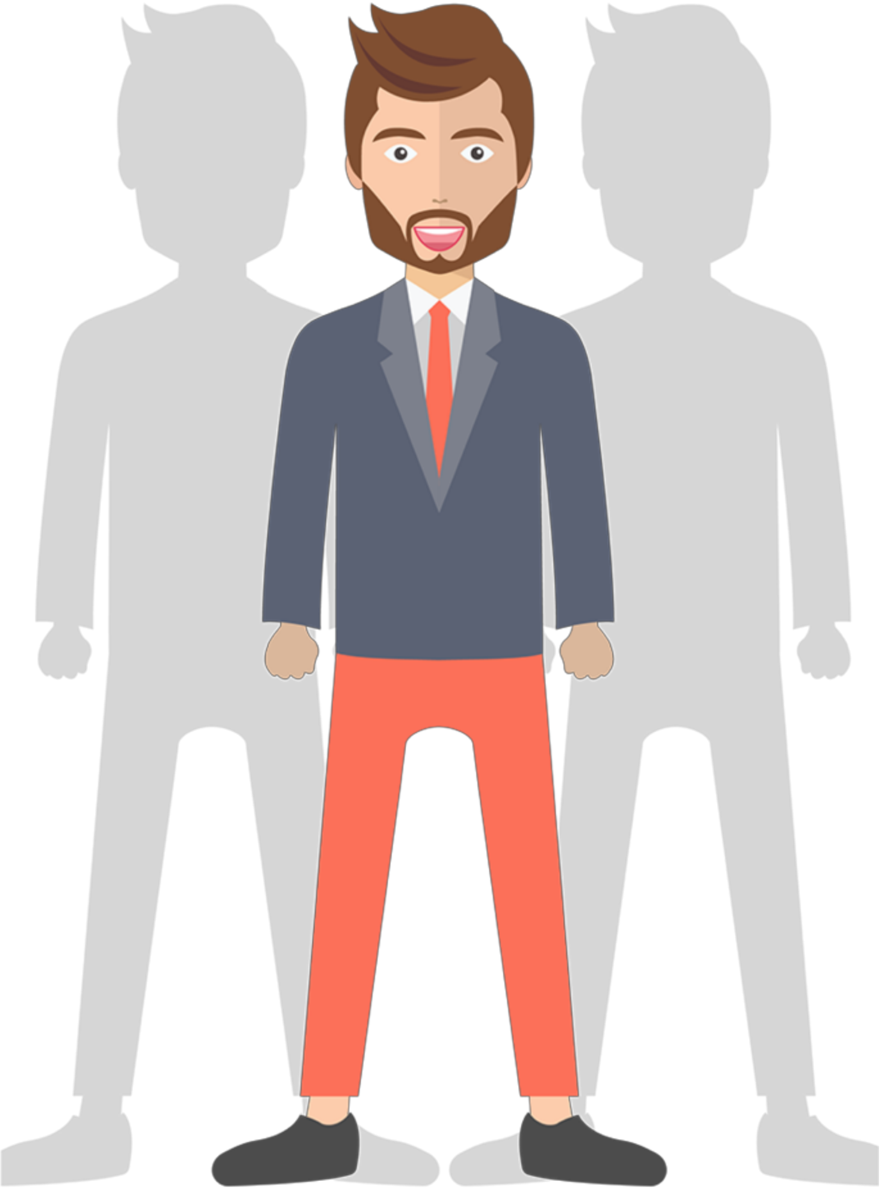
```
/routing ospf network add
network=0.0.0.0/0 area=backbone
```

# OSPF Basics



Your network will start to run the OSPF protocol and now you start to think that you are an OSPF engineer!

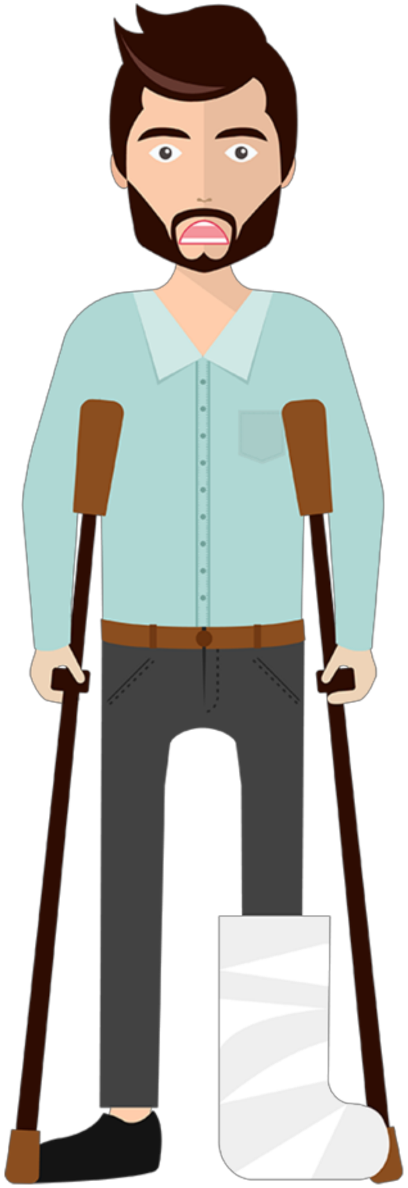
# OSPF Basics



- Network Type?
- Priority?
- DR?
- BDR?

I don’t need to know these f***g things, by default everything is working!

# OSPF Basics



But when this network starts to grow you will not be smiling anymore.

That’s why you need a better knowledge of how OSPF works!

# OSPF Basics

I will not cover all the aspects of the OSPF and, of course, I will not deliver a MTCRE training class in 20 minutes ☺

We will see some of the most interesting things, tips and mistakes that we can do using the OSPF protocol.

# The OSPF Router's POV

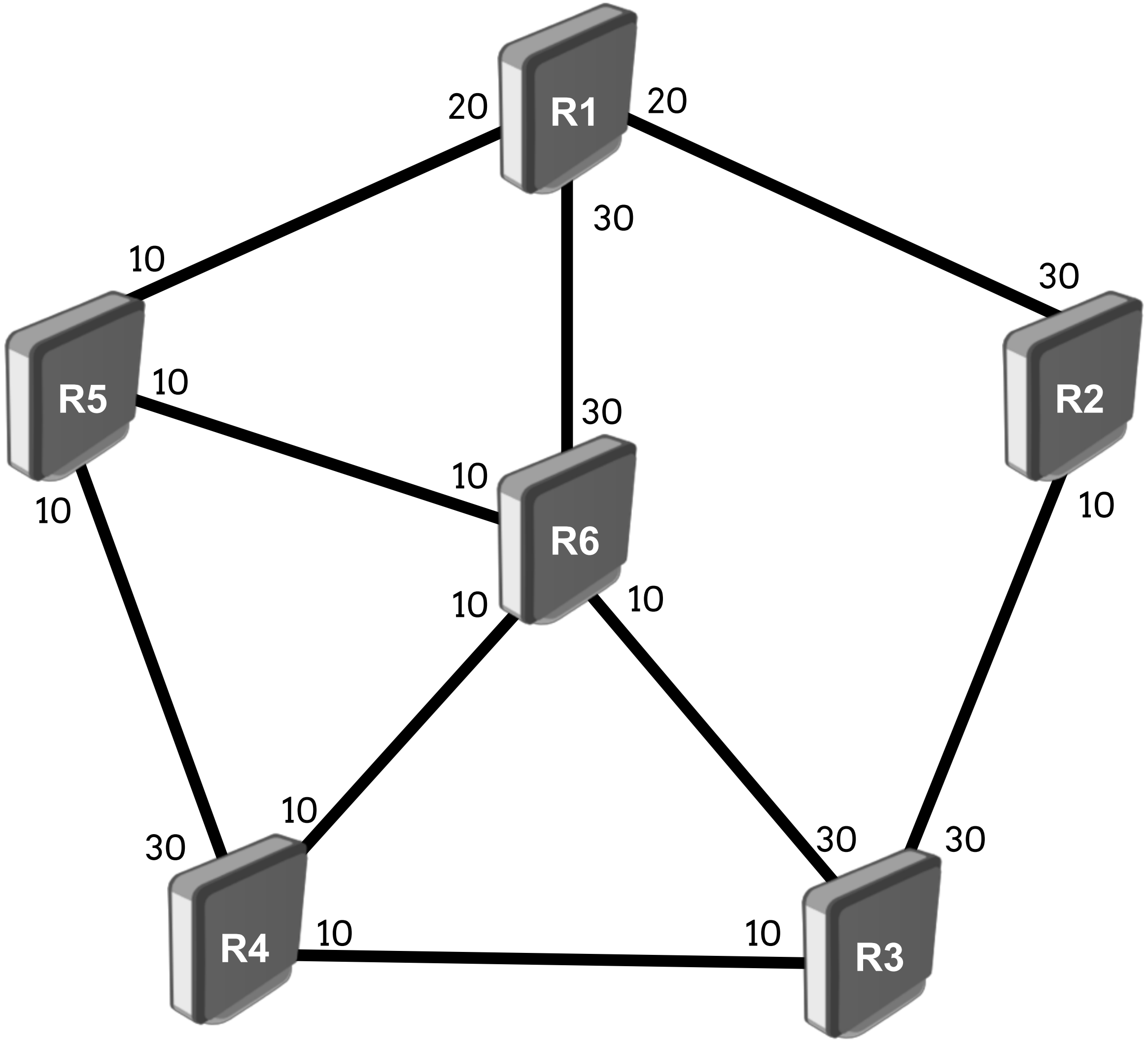
(**P**oint **O**f **V**iew)

# The OSPF Router's POV

In OSPF networks there is **no** "main" or "central" router that knows the "topology" of the network and the shortest path between them.

An **OSPF Router thinks they are the "core"** of their network, regardless of their real 'position' in your network.

# The OSPF Router's POV



# The OSPF Router's POV

Then each router, individually, calculates all the paths and their costs, for each known destination.

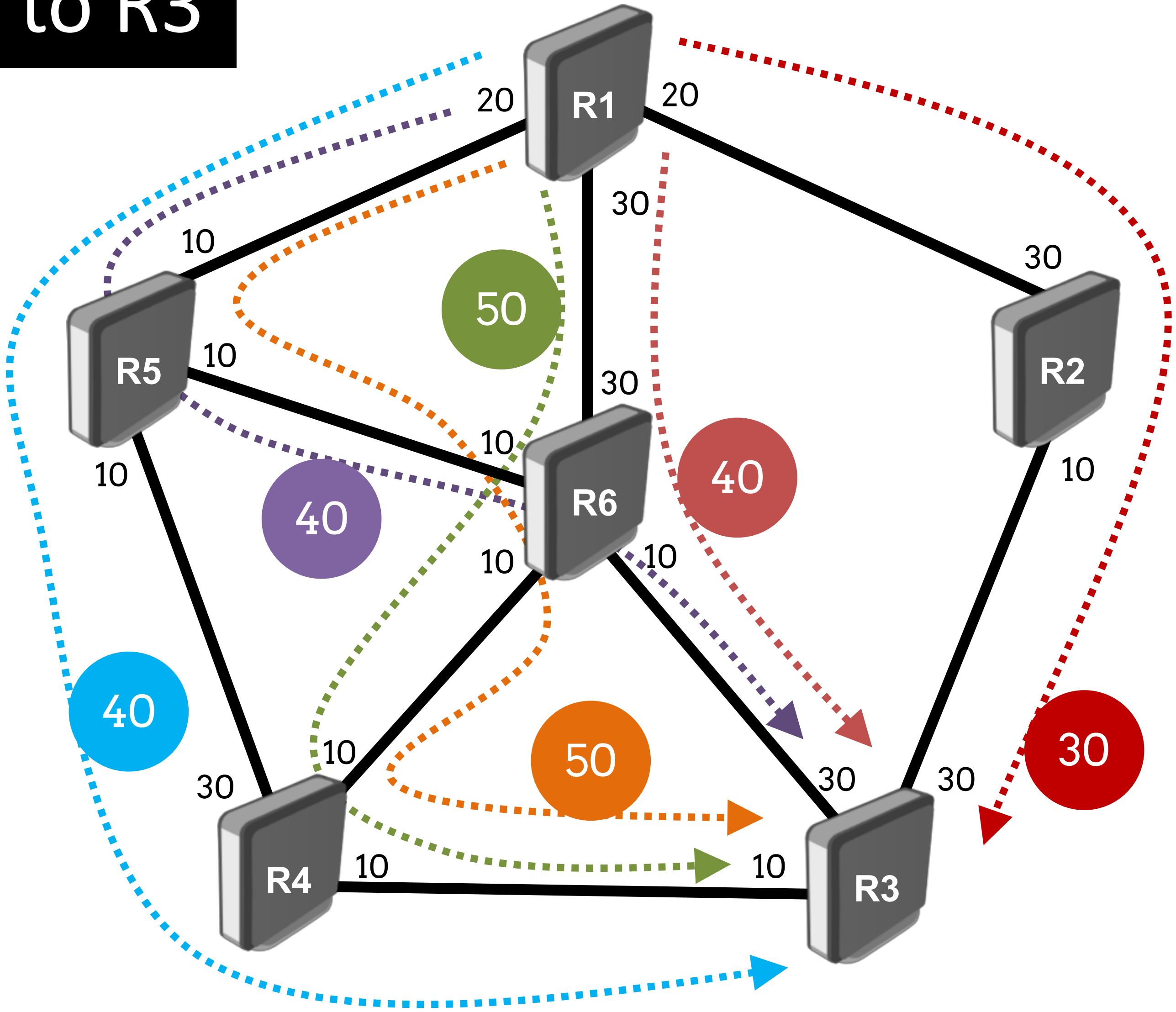
Then chooses the "shortest" (or cheapest) one.

**From <u>his</u> own point of view.**

(we will not show ALL the possible combinations)

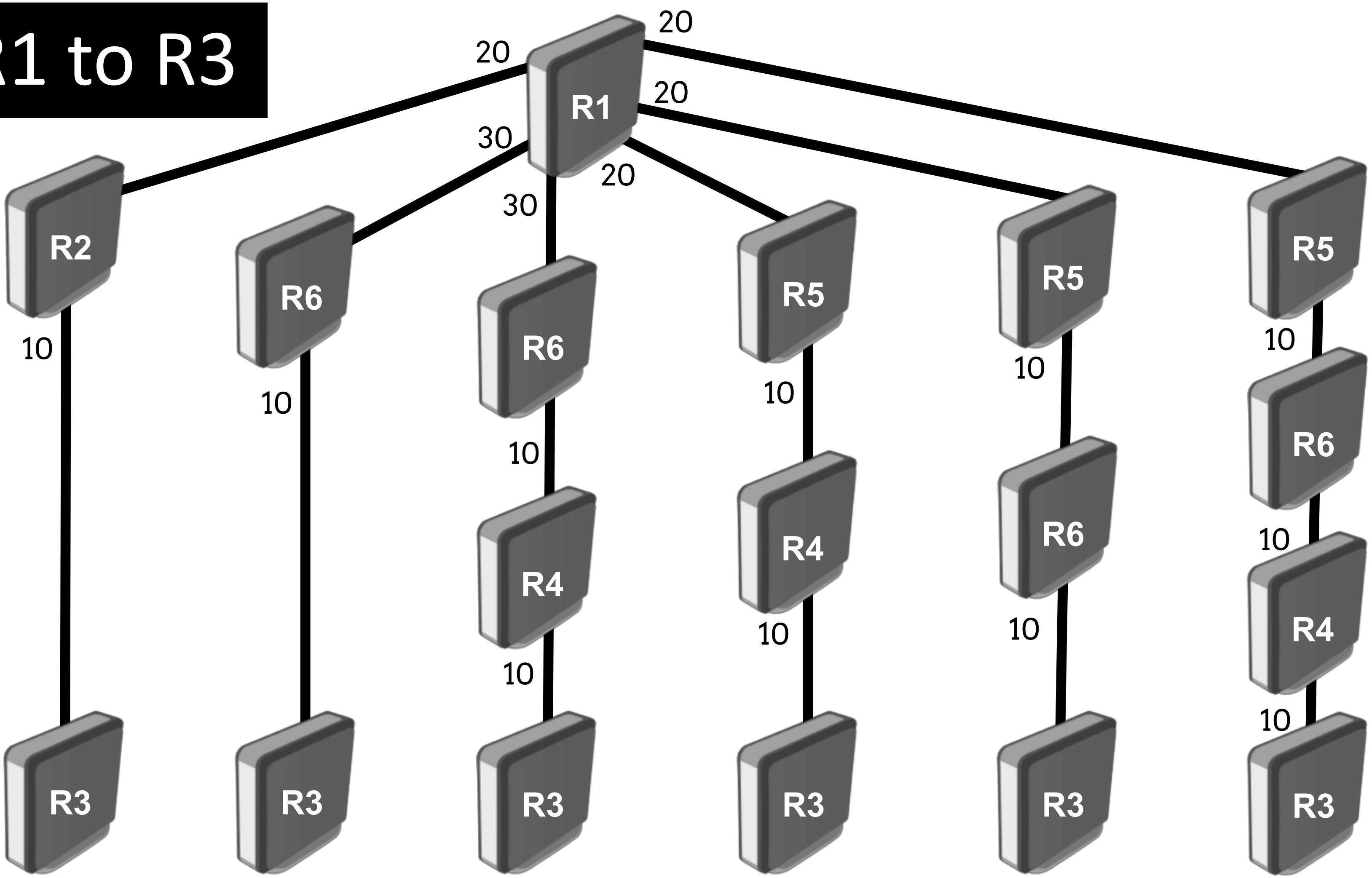
# The OSPF Router's POV

From R1 to R3



# The OSPF Router's POV

From R1 to R3



PATH COST

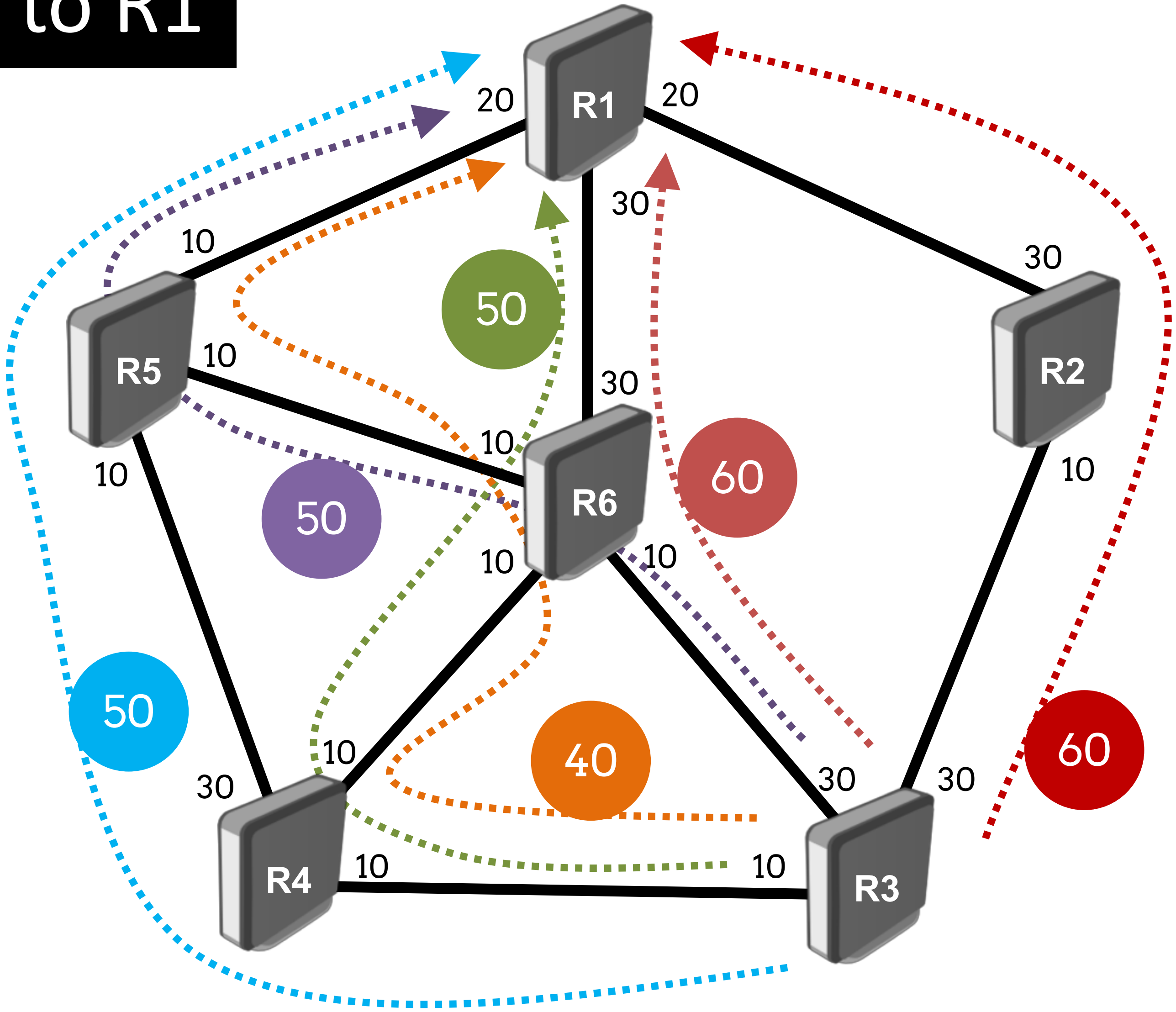
| 30 | 40 | 50 | 40 | 40 | 50 |
|---|---|---|---|---|---|

# The OSPF Router's POV

As I showed the paths **from R1 to R3**, that are only **in one direction**, let’s now look at the paths **back from R3 to R1**.

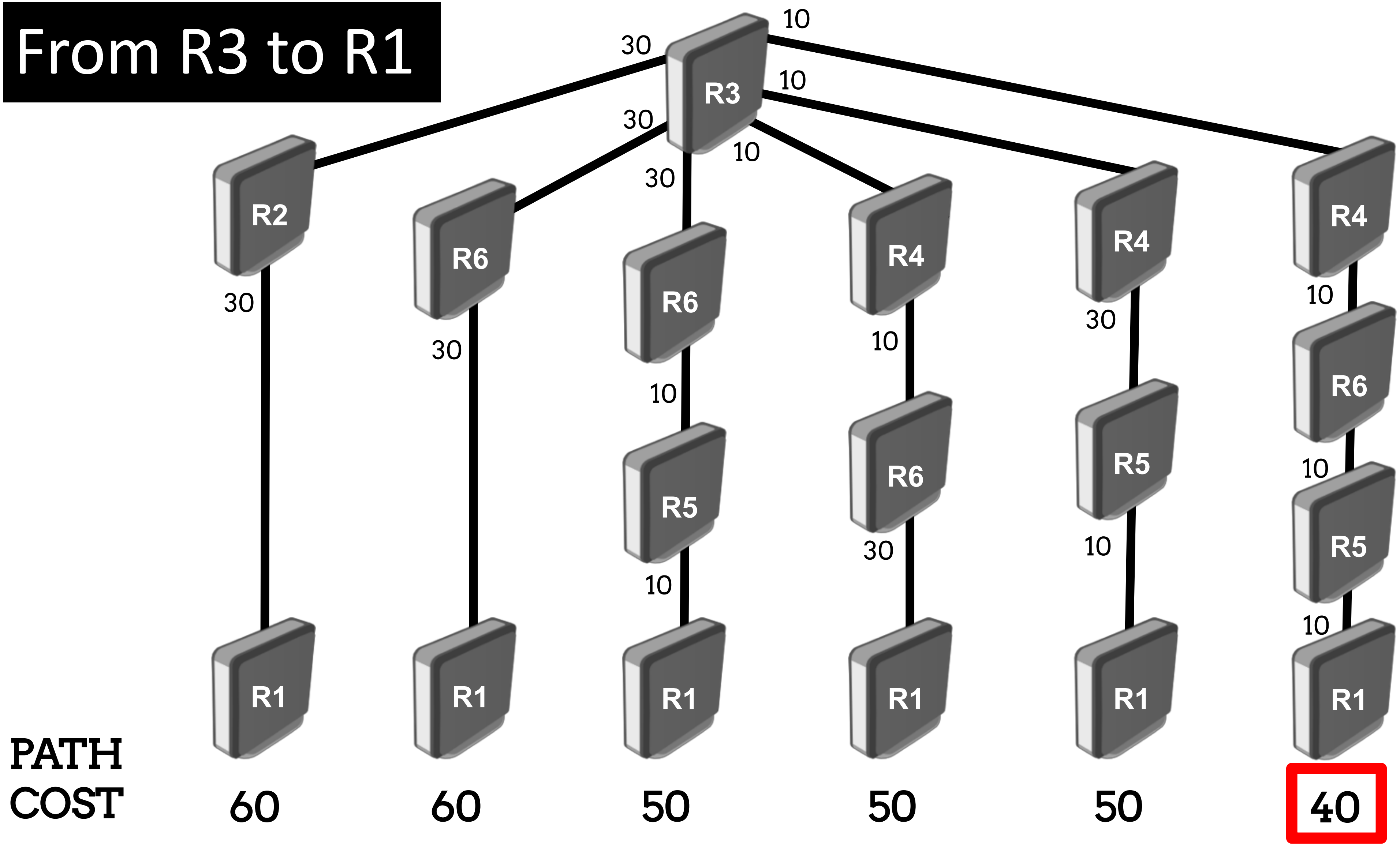
# The OSPF Router's POV

From R3 to R1



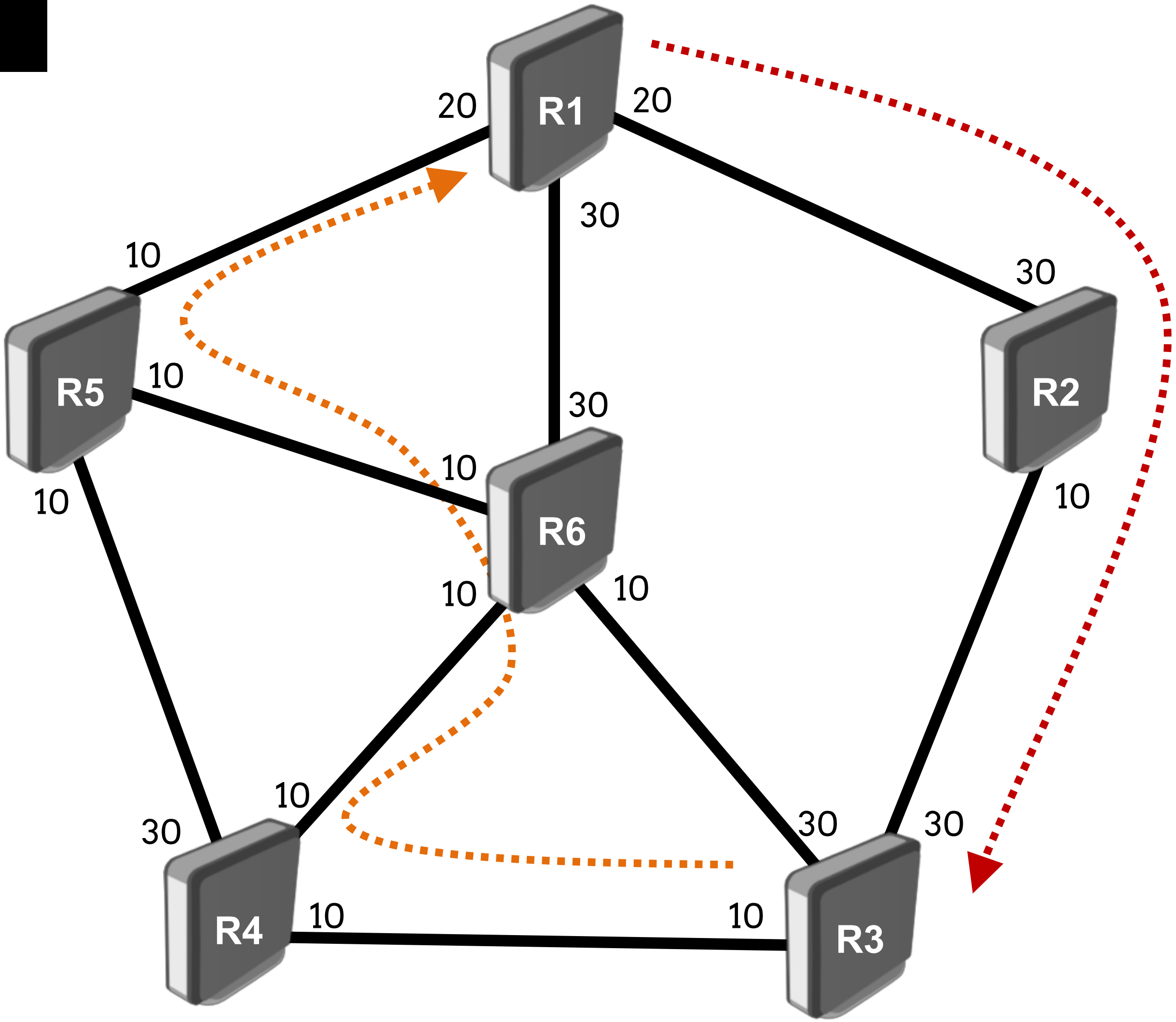
# The OSPF Router's POV

From R3 to R1



# The OSPF Router's POV

R1 <--> R3



# The OSPF Router's POV

One of the common mistakes is to check the paths from one side only.

That’s why **you should look** at the paths **from both sides**.

# The role of the backbone area

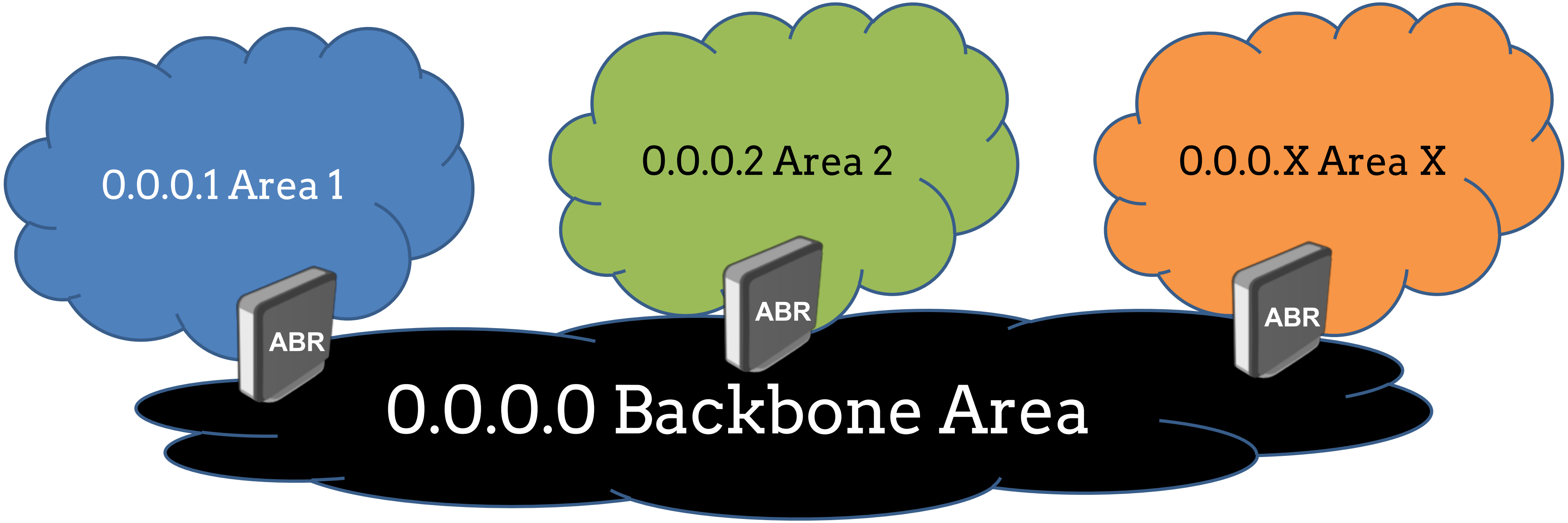
# The Backbone Area

The **backbone** area (**area-id=0.0.0.0**) forms **the core** of an **OSPF network**.

0.0.0.0 Backbone Area

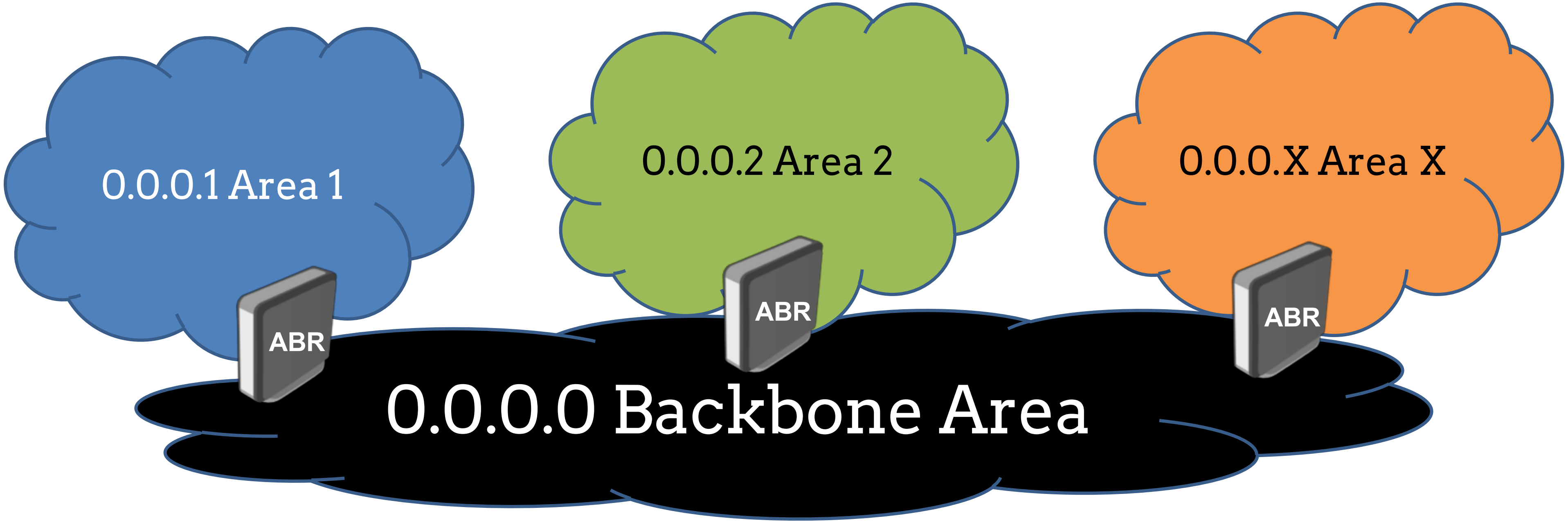
# The Backbone Area

The backbone is responsible for **distributing routing information** between other **non-backbone** areas.



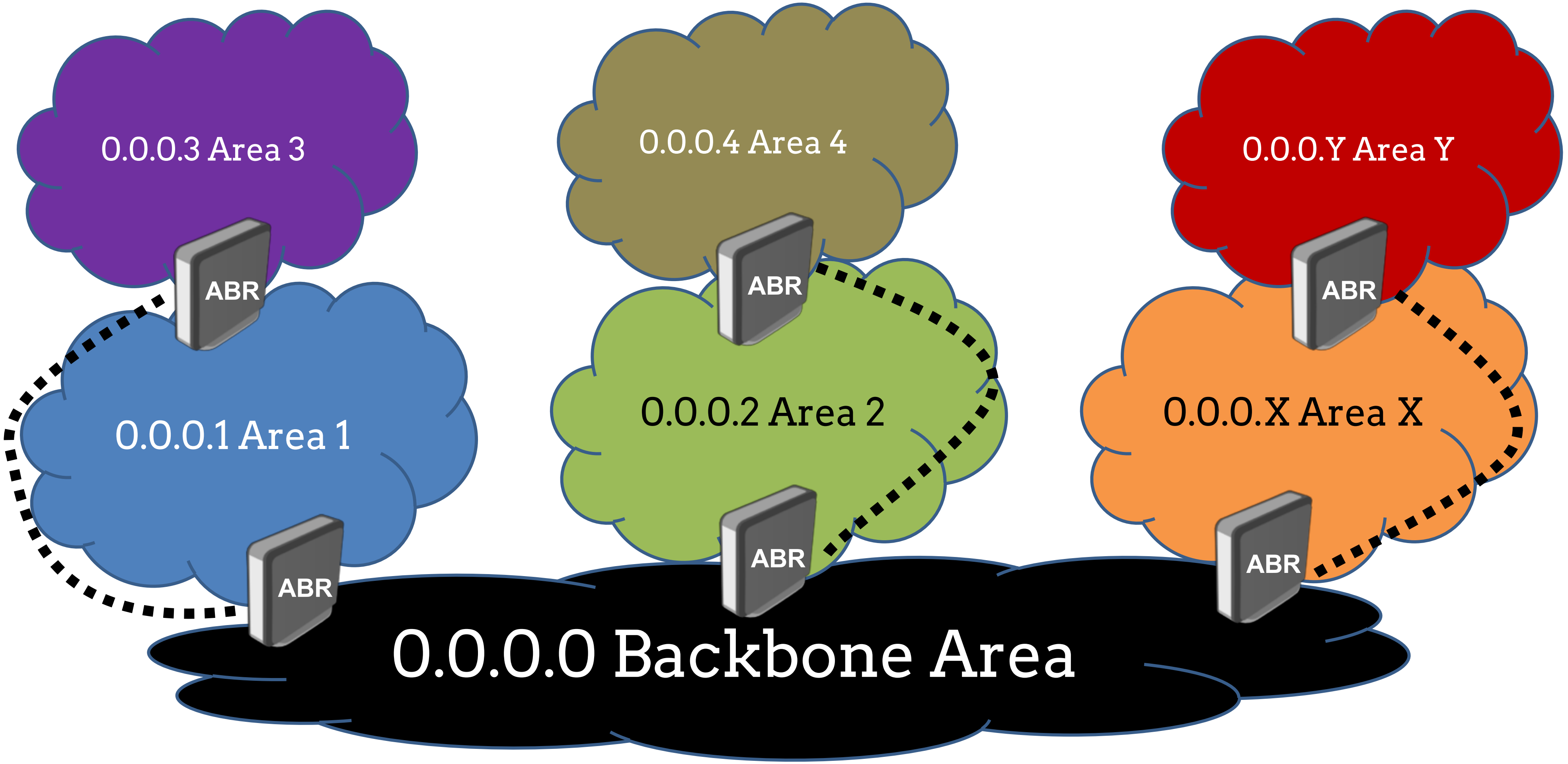
# The Backbone Area

Each non-backbone area must be directly **connected to the backbone area** (**directly** or through a ‘virtual link’)



# The Backbone Area

Each non-backbone area must be directly **connected to the backbone area** (directly or through a '**virtual link**')

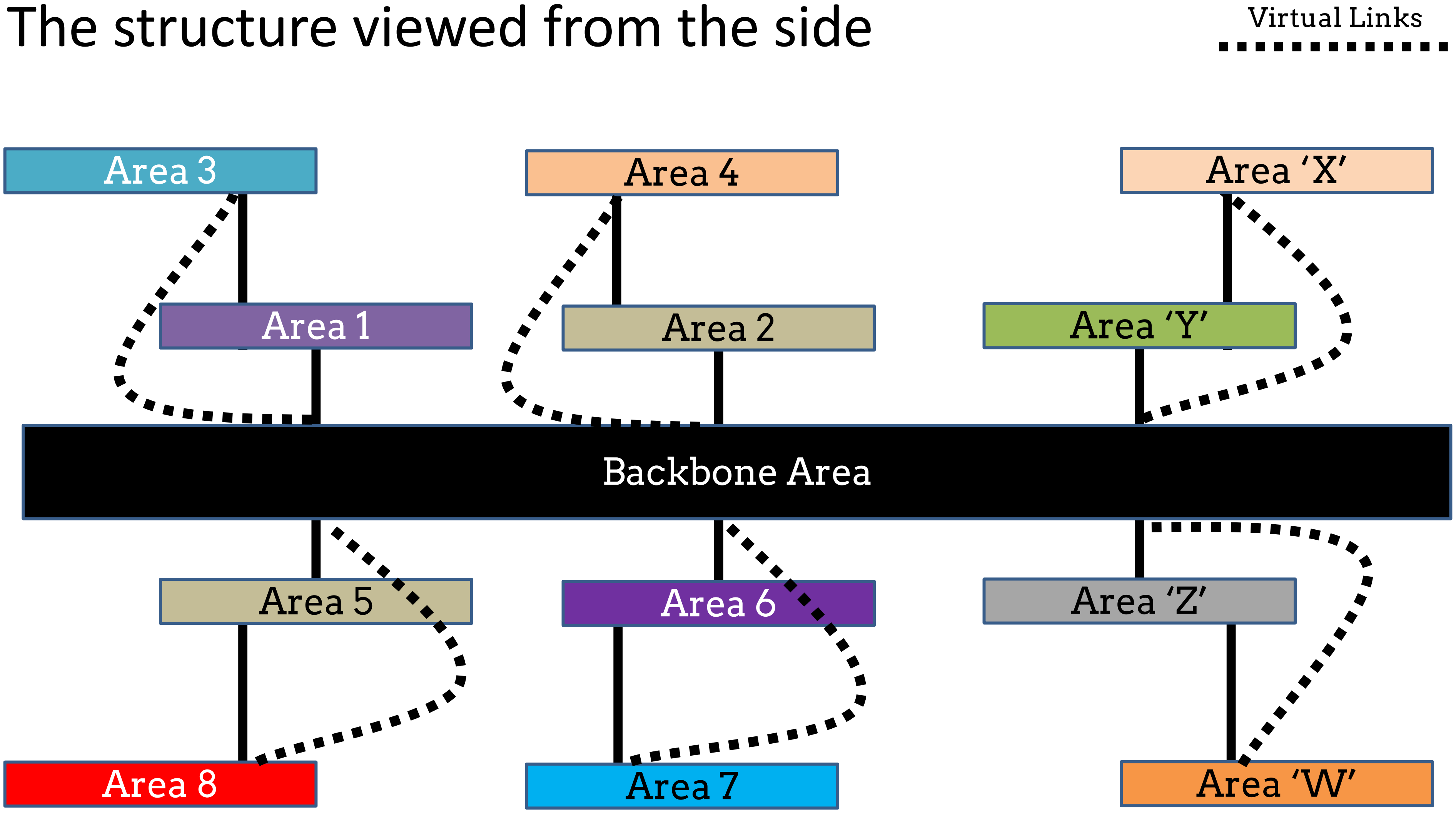


# The Backbone Area

By the previous definitions you can create no more than two “layers” of areas on top the backbone one.

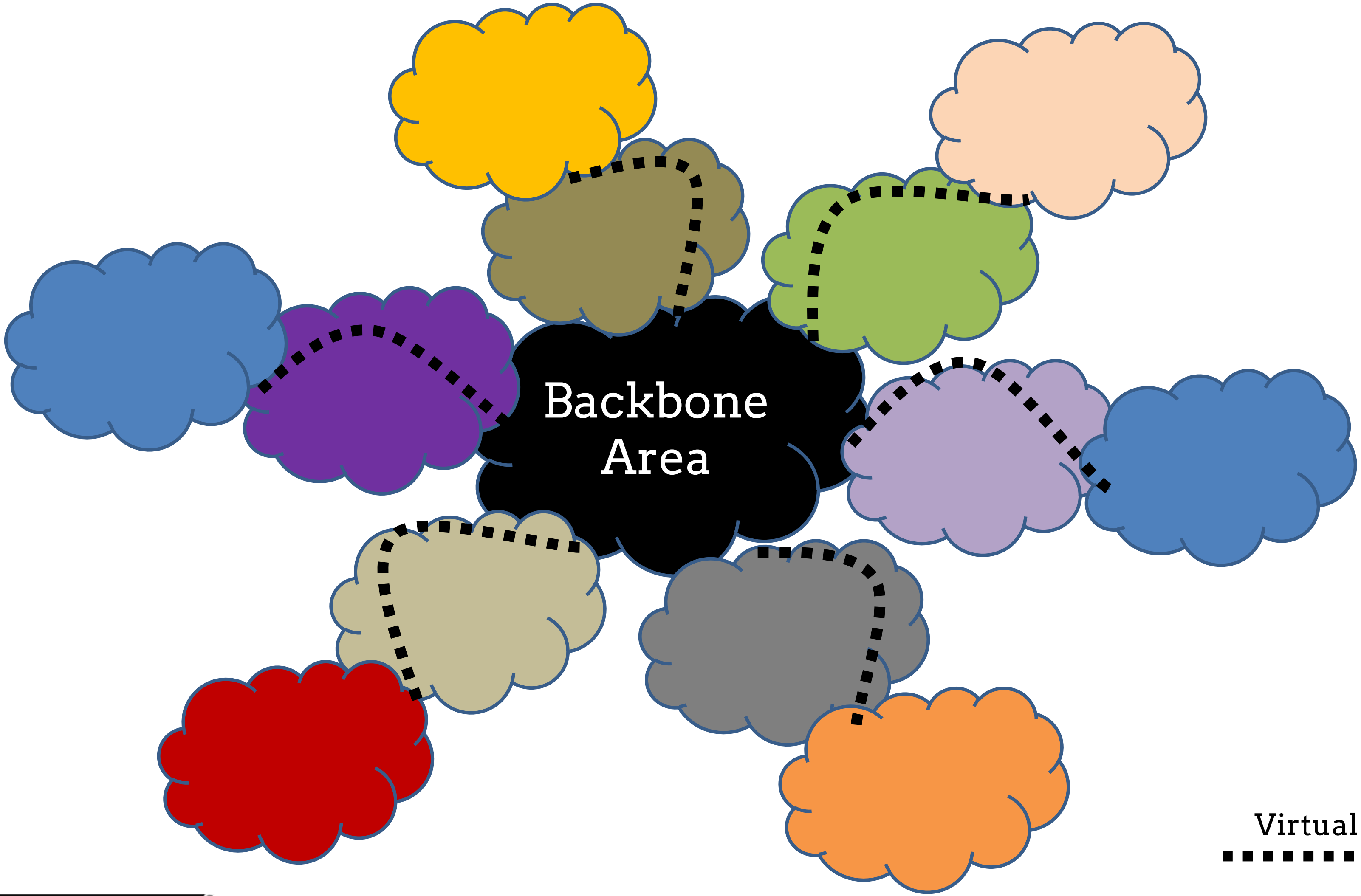
# The Backbone Area

The structure viewed from the side



# The Backbone Area

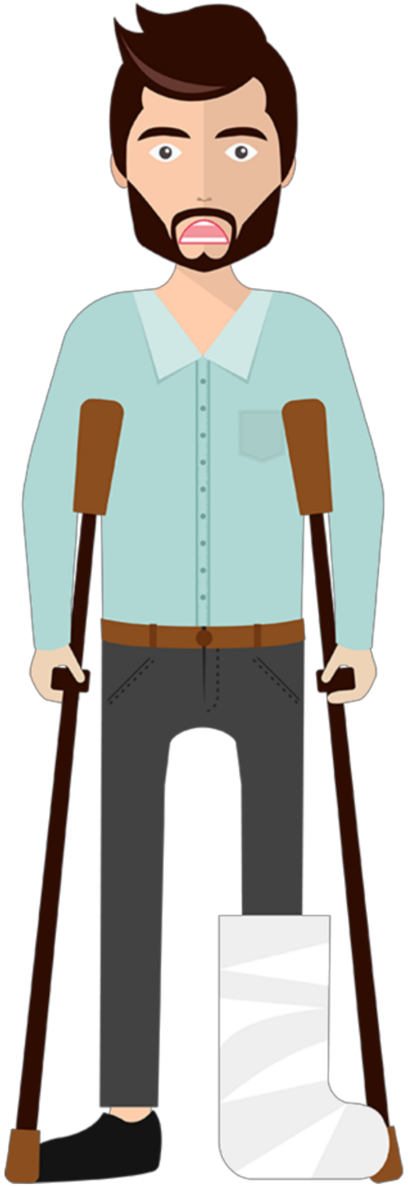
Or like a flower ☺ (viewed from top)



Virtual Links ■■■■■■■■■■■■■

# Common OSPF mistakes

# Common OSPF mistakes



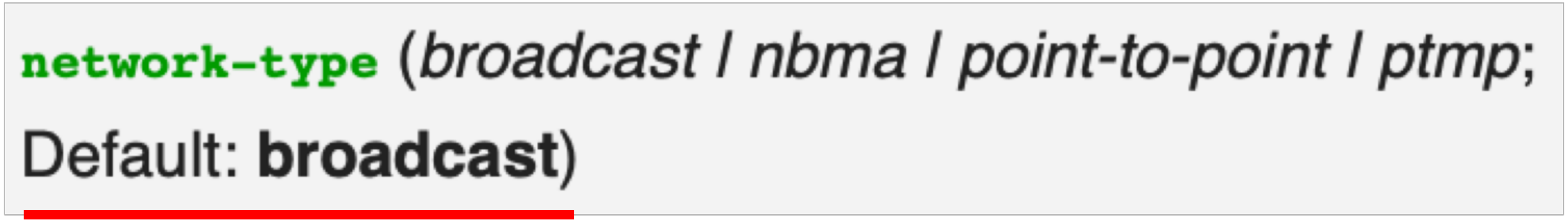
Some common thoughts about OSPF:

- “OSPF is weird.”
- “It works when it wants to.”
- “When it doesn’t want to work it doesn’t work.”

Let’s take a look …..

# OSPF Network Types

From the wiki.mikrotik.com:



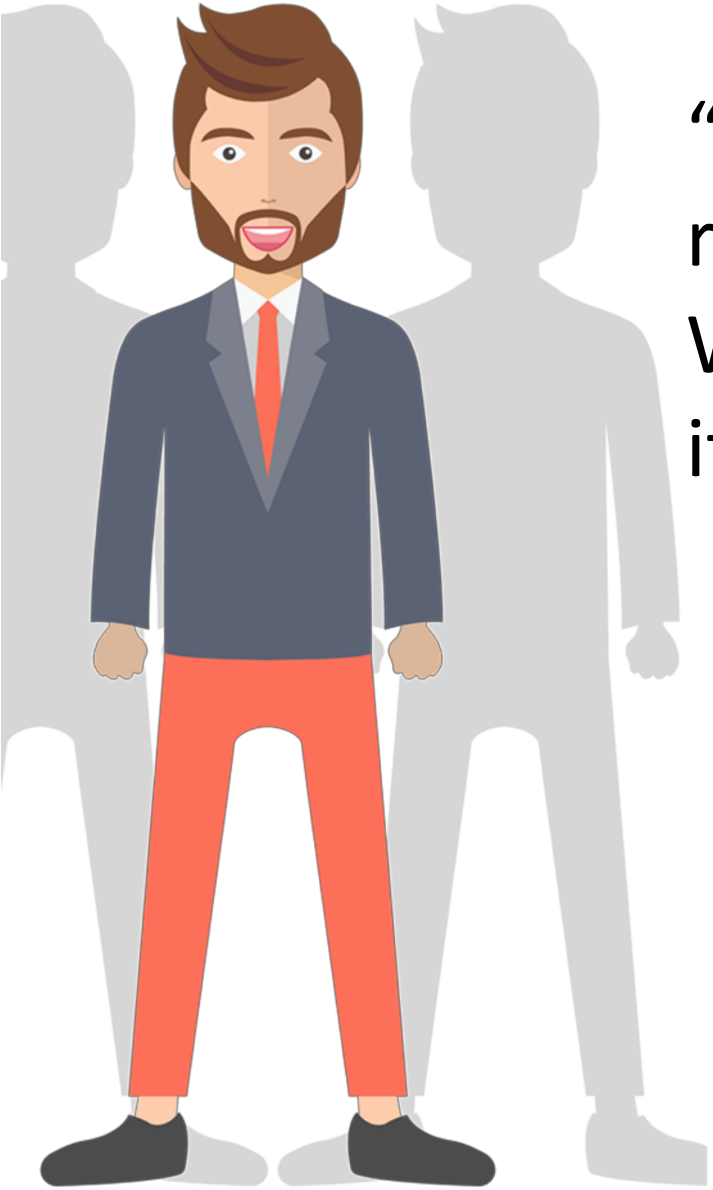
**network-type** (*broadcast | nbma | point-to-point | ptmp;*

Default: **broadcast**)

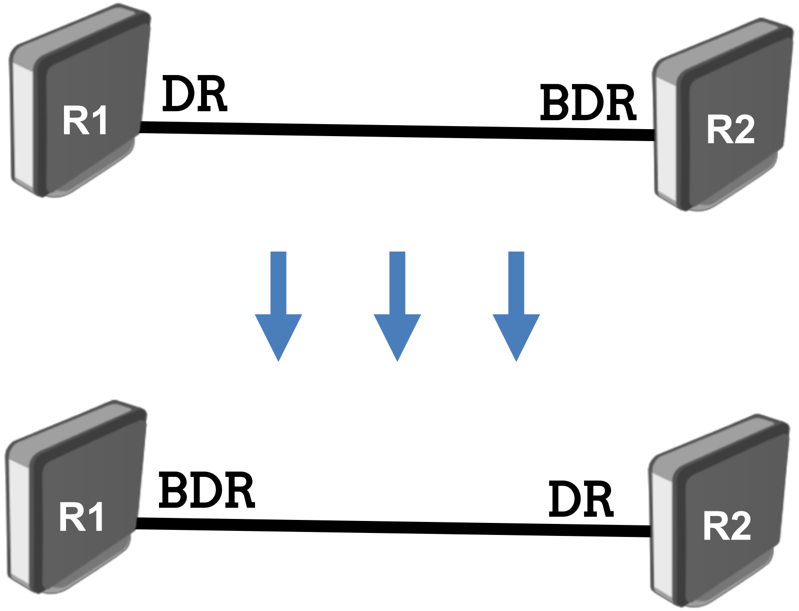
***Broadcast*** and the ***nbma*** types elect a **designated router** (DR) and a **BDR,**

the ***point-to-point*** and the ***ptmp*** does not.

# OSPF Network Types



“This link is working fine, one router reboots and the **DR** *just changes*. When the previous one coming back it *becames* a **BDR.** No problem.” 😂



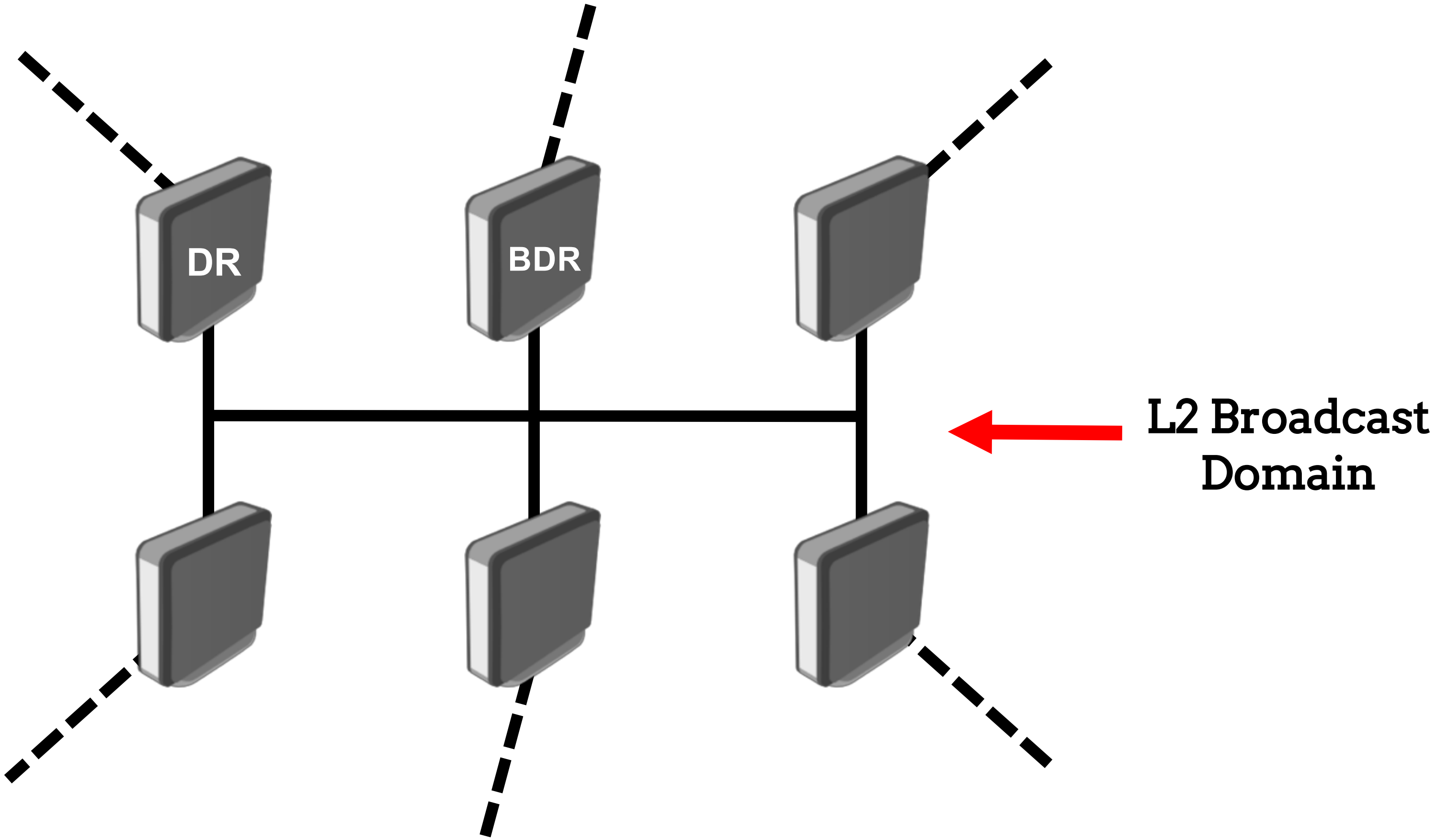
# DR and BDR

The Designated Router (DR) and the Backup DR (BDR) are useful when you have **multiple** OSPF routers in the same Layer 2 broadcast domain, to reduce the OSPF traffic.

[The DR maintains a complete topology table of the network and sends updates to the other routers participating in OSPF updates.]

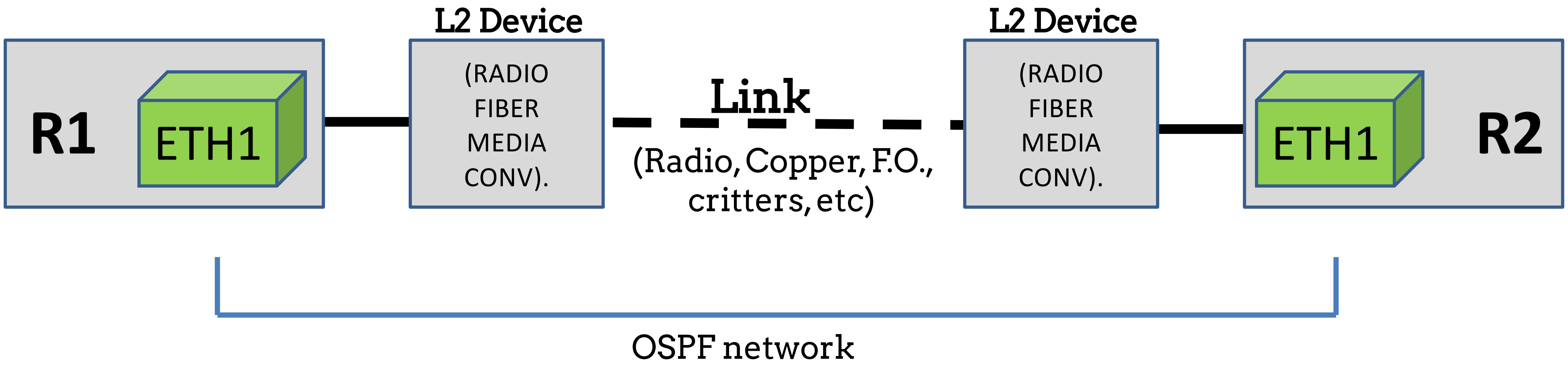
# DR and BDR

They were designed for scenarios like this one: **more than two OSPF routers** in the same L2 broadcast domain.



# DR and BDR

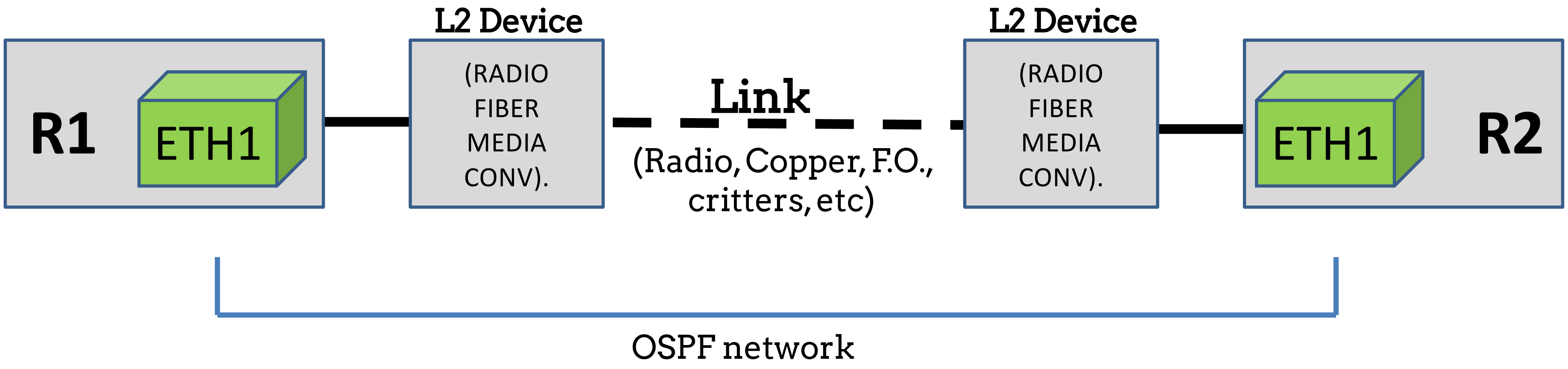
Let’s now take these details into account and try to look in depths. This is a “typical” OSPF networks between two routers, connected by L2 through L2 devices.



# DR and BDR

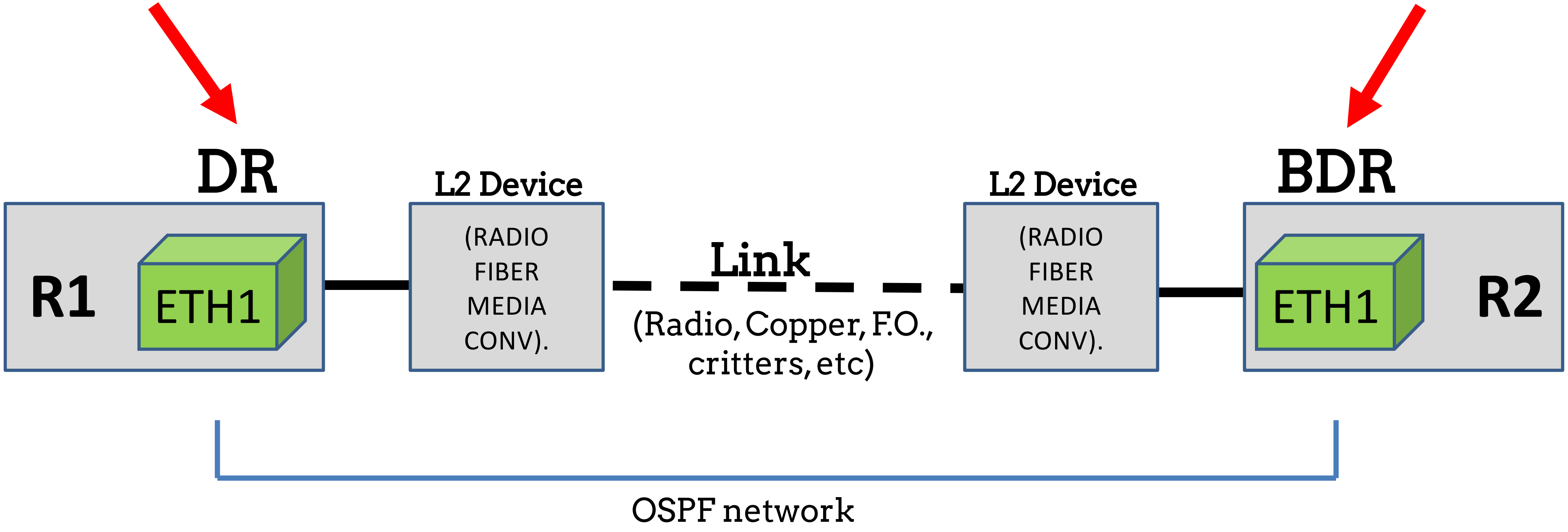
By “default” both of the ETH1 (in Routing / OSPF / Interfaces) will have:

`network type=broadcast and priority=1`


L2 Device
L2 Device
R1
ETH1
(RADIO FIBER MEDIA CONV).
Link
(Radio, Copper, F.O., critters, etc)
(RADIO FIBER MEDIA CONV).
ETH1
R2
OSPF network

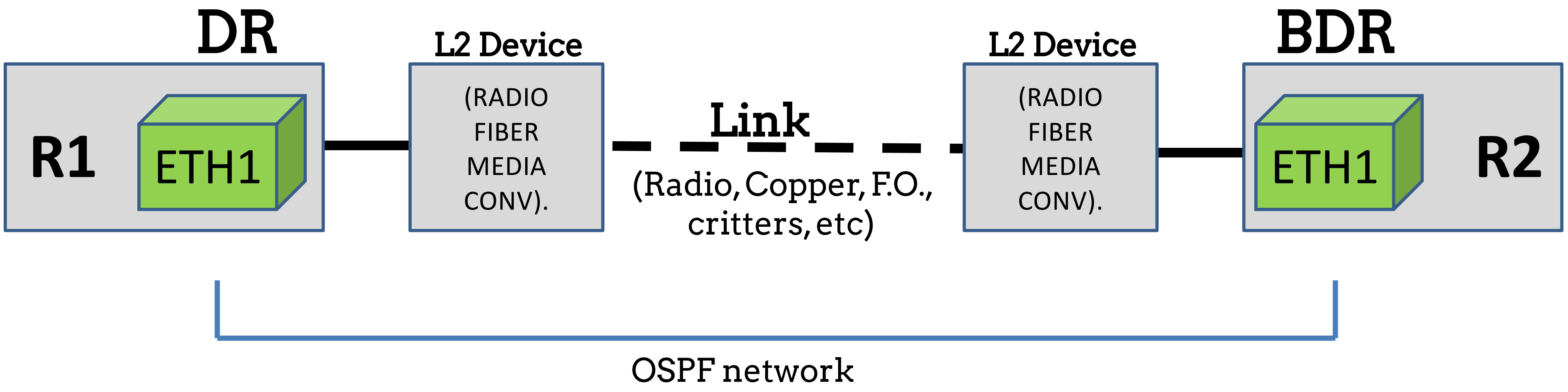
# DR and BDR

And as a consequence we will have one **DR** and one **BDR**.



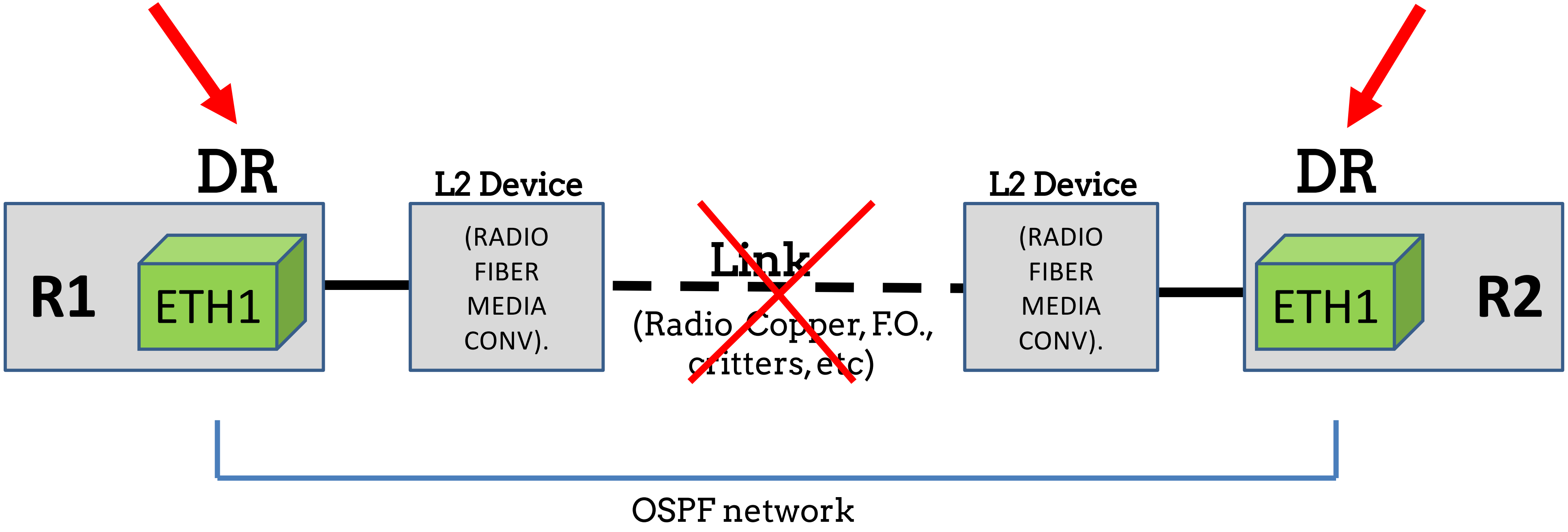
# DR and BDR

Everything is running fine until something happens ....



# DR and BDR

The link goes down. But both of the routers will have the ethernet ports “running”, and **THEY BOTH BECOME DR**!!!!



# DR and BDR

And the question is:

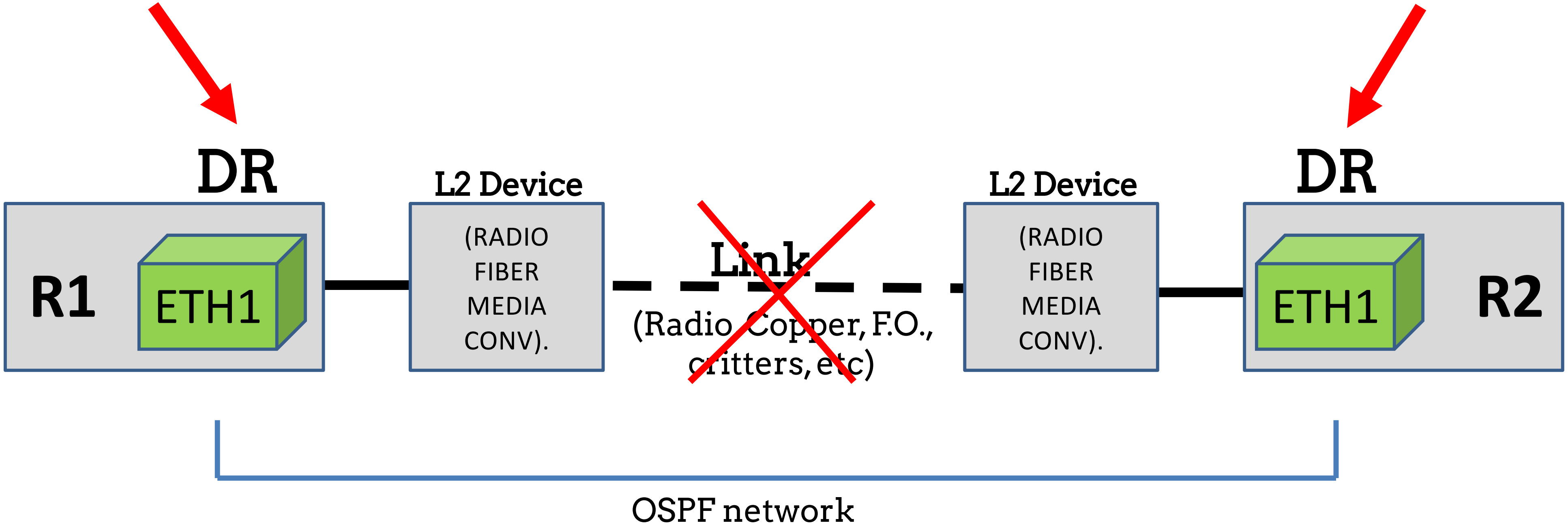
What happen when the L2 Link will be restored?

# DR and BDR

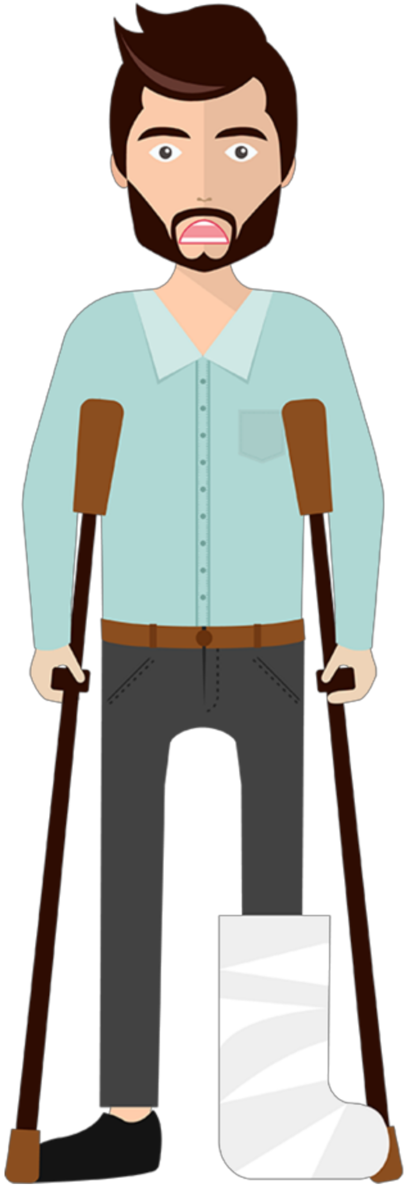
They will "fight" one against the other, **both are now DR** and no one would like to be BDR anymore.

# DR and BDR

The result: this **OSPF network is not working**, and usually will require lots of time

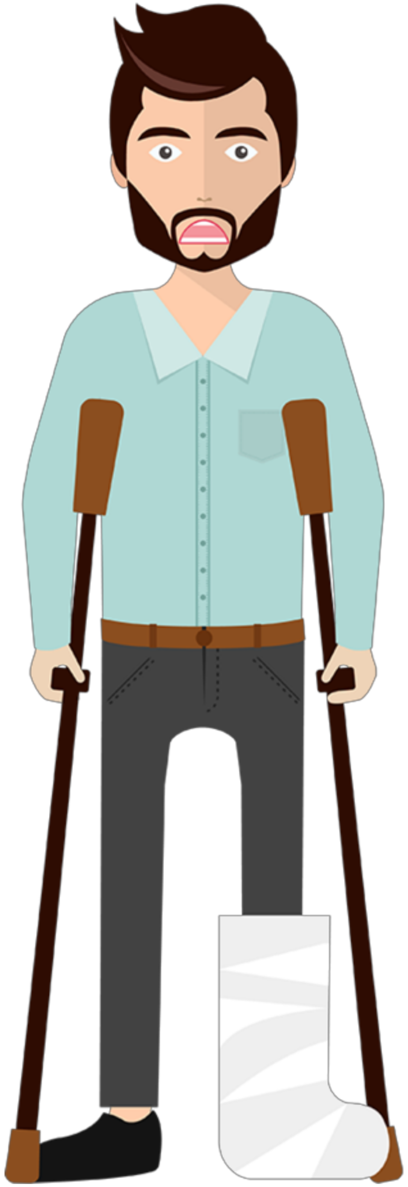


# The “Engineer” thoughts:



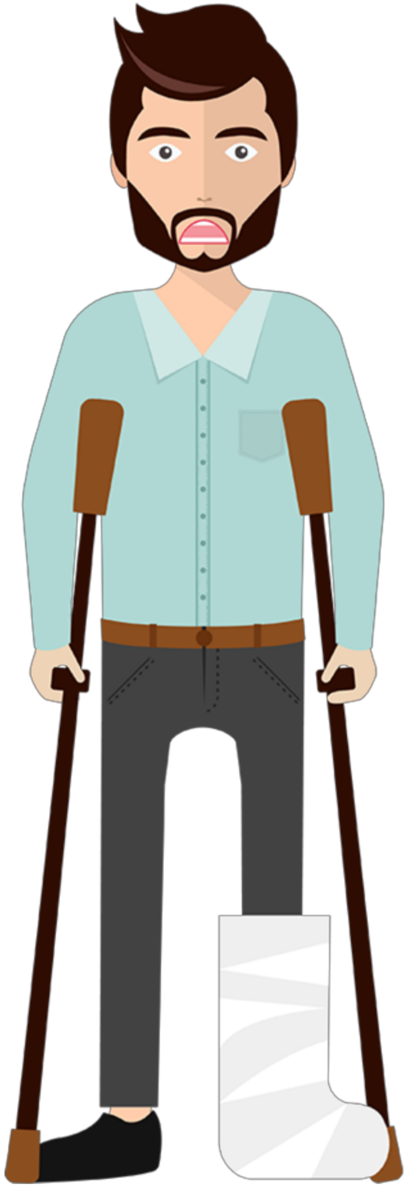
“I just rebooted the router and it just worked again”

# The “Engineer” thoughts:



“Maybe the OSPF protocol have some bugs”

# The “Engineer” thoughts:



“RouterOS does not implement the OSPF protocol well”

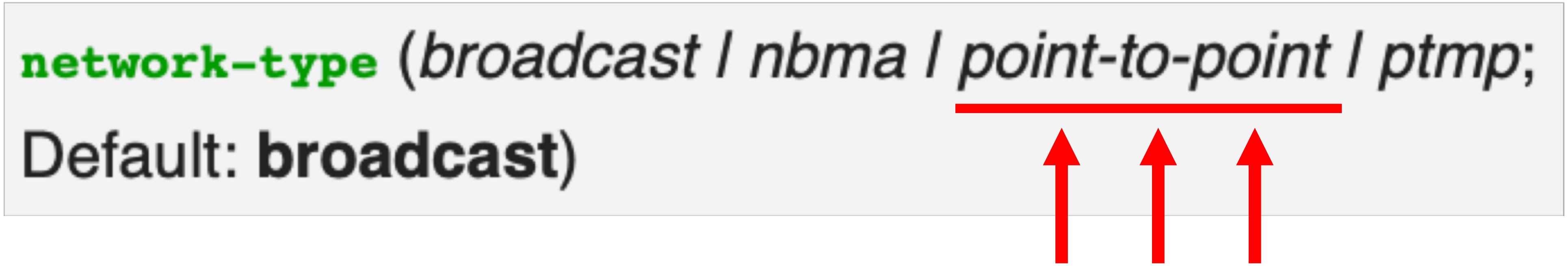
# Do we have a better solution?

# Do we have a better solution?

Yes, we should use the proper **`network type`** for this scenario.

We don't need a DR and a BDR between just **two** routers.

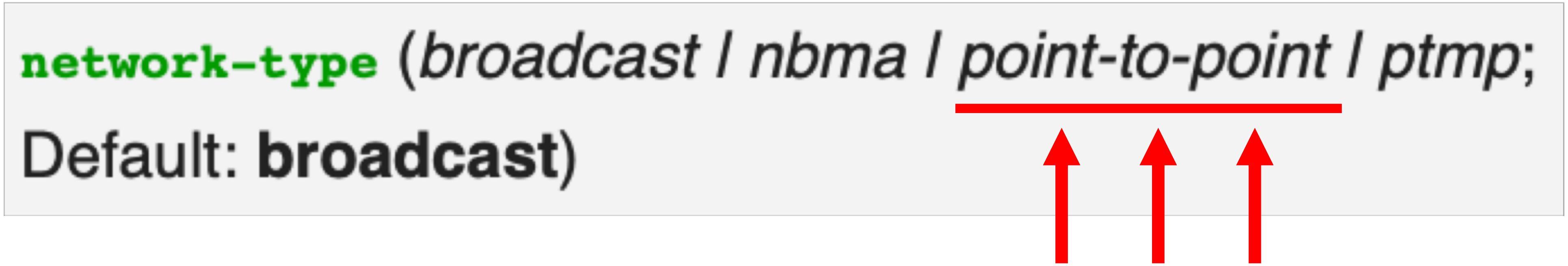
# Do we have a better solution?



**network-type** (*broadcast | nbma | point-to-point | ptmp*; Default: **broadcast**)

The **`point-to-point`** is a network type that will run OSPF between **two** routers only and does **not elect** designated router.

# Do we have a better solution?



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The **`point-to-point`** is a network type that will run OSPF between **two** routers only and does **not elect** designated router.

# Do we have a better solution?

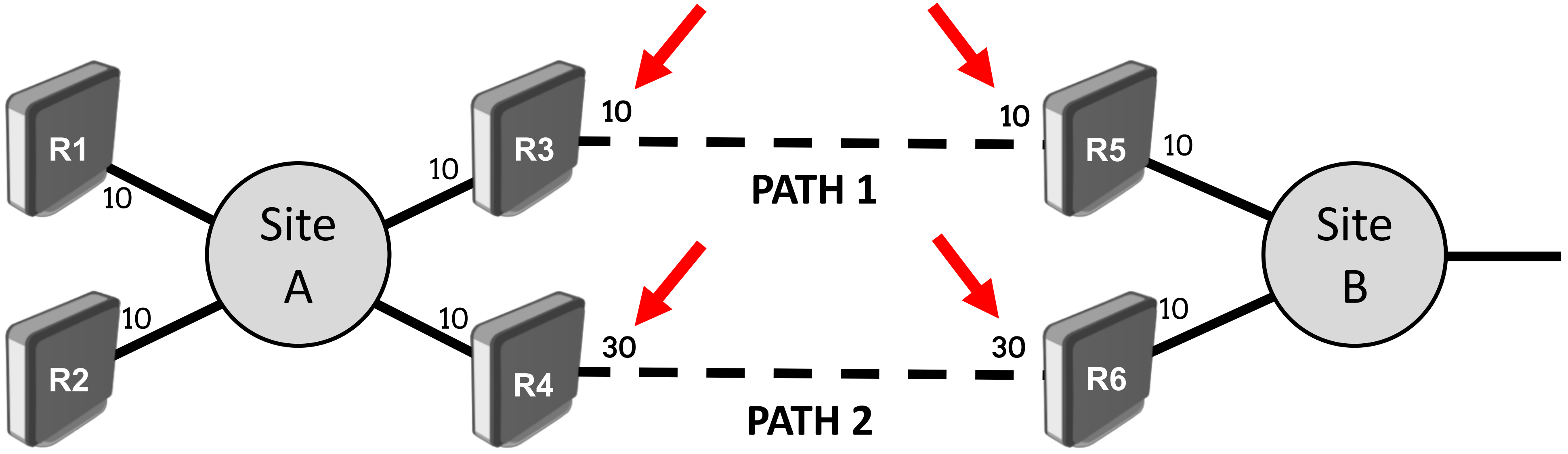
Using the proper network type between two OSPF routers will save lot of lifes.

Think about that the next time you’re doing that!

# OSPF Extra tips

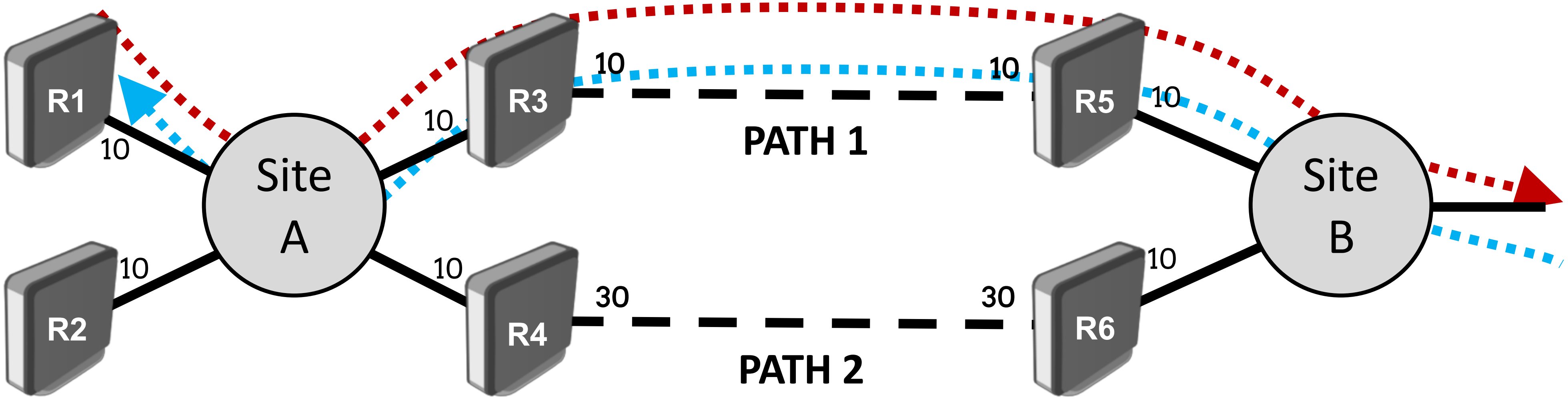
# OSPF Extra tips

Is quite easy to use two OSPF paths as: **failover**



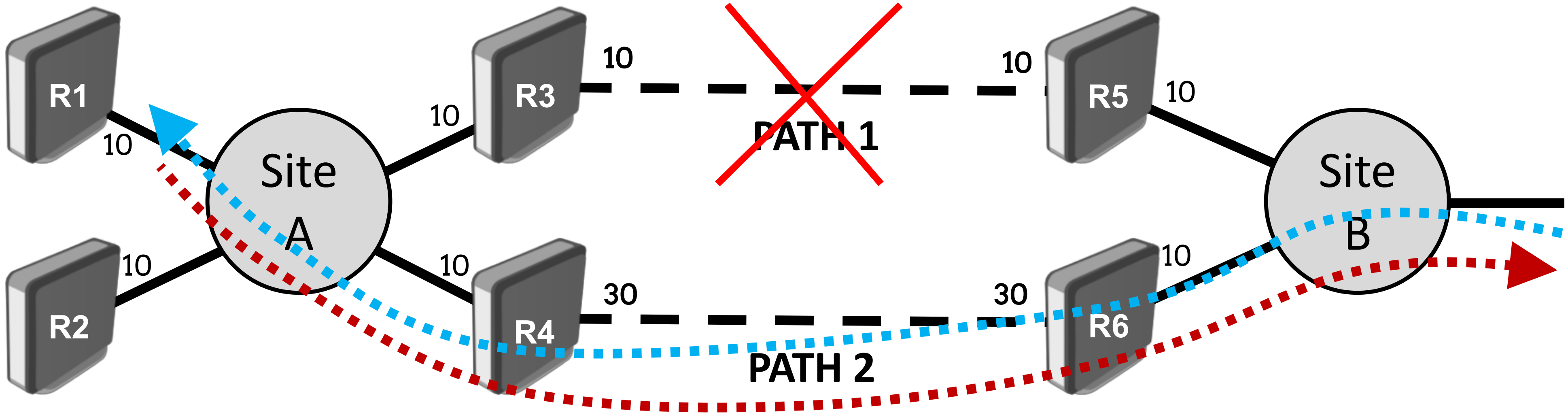
# OSPF Extra tips

ALL the traffic from/to R1 and from/to R2 will go through the PATH 1



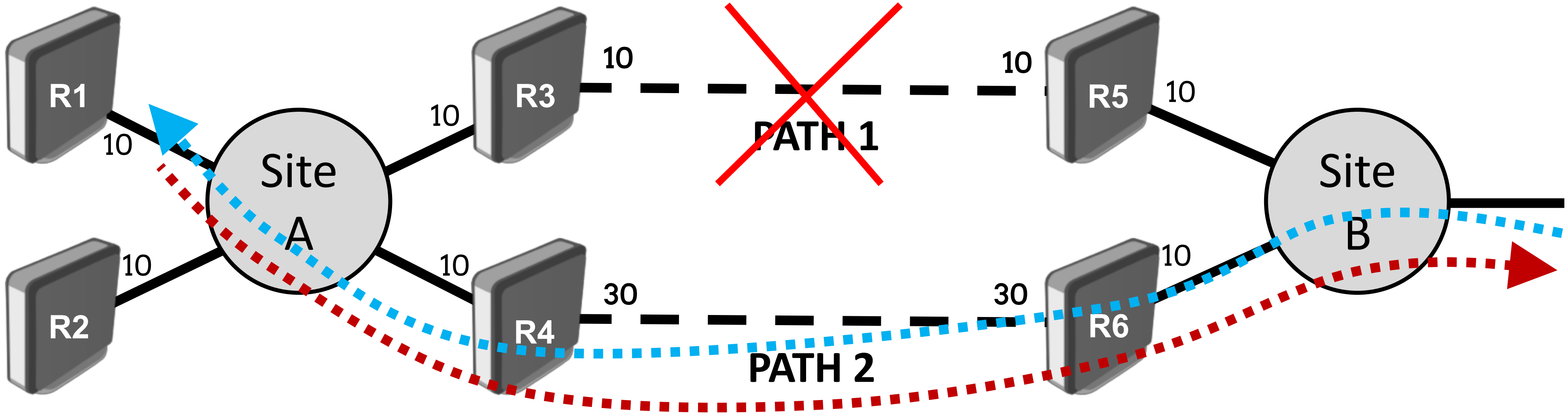
# OSPF Extra tips

In case of failure of the PATH 1 all the traffic from/to R1 and from/to R2 will go through PATH 2.



# OSPF Extra tips

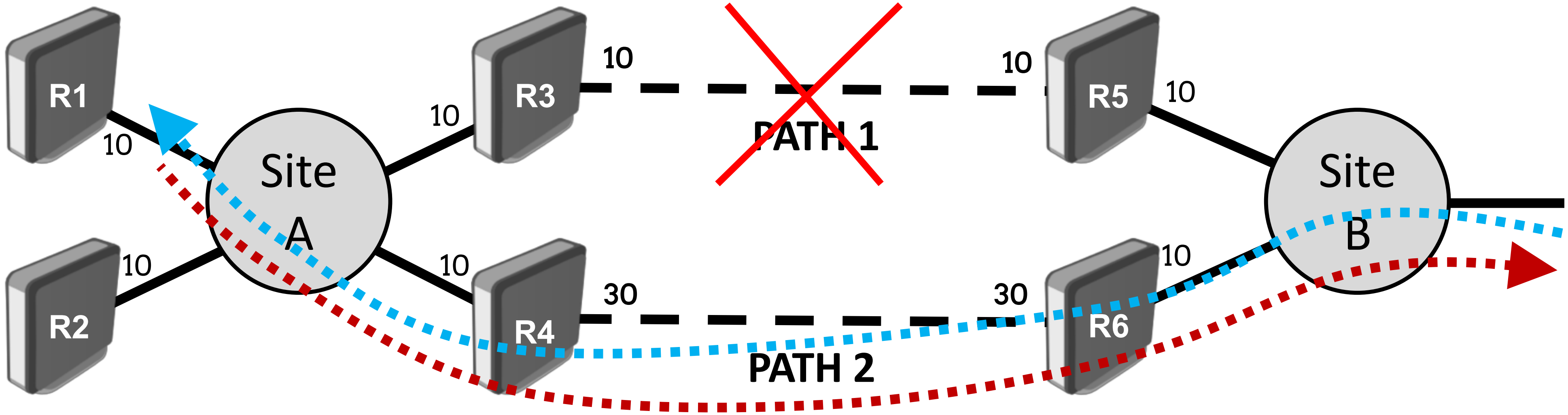
This is one of the most used OSPF technique in the ISP/WISP industry.



# OSPF Extra tips

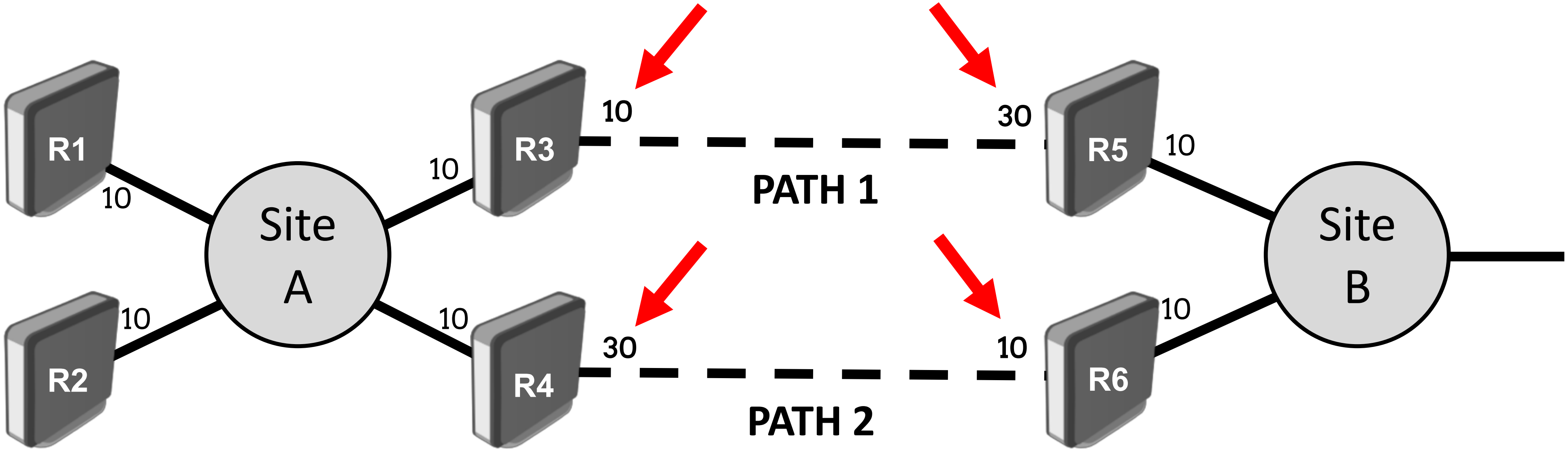
**Pros**: traffic into the same path

**Cons**: one “unused” path



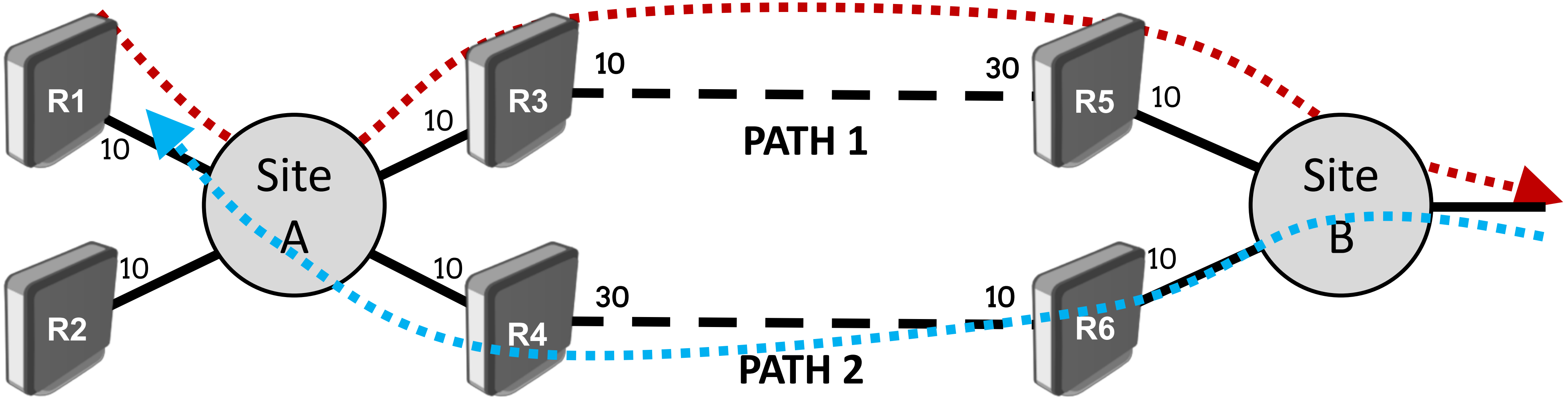
# OSPF Extra tips

Another scenario: **load sharing upload/download**



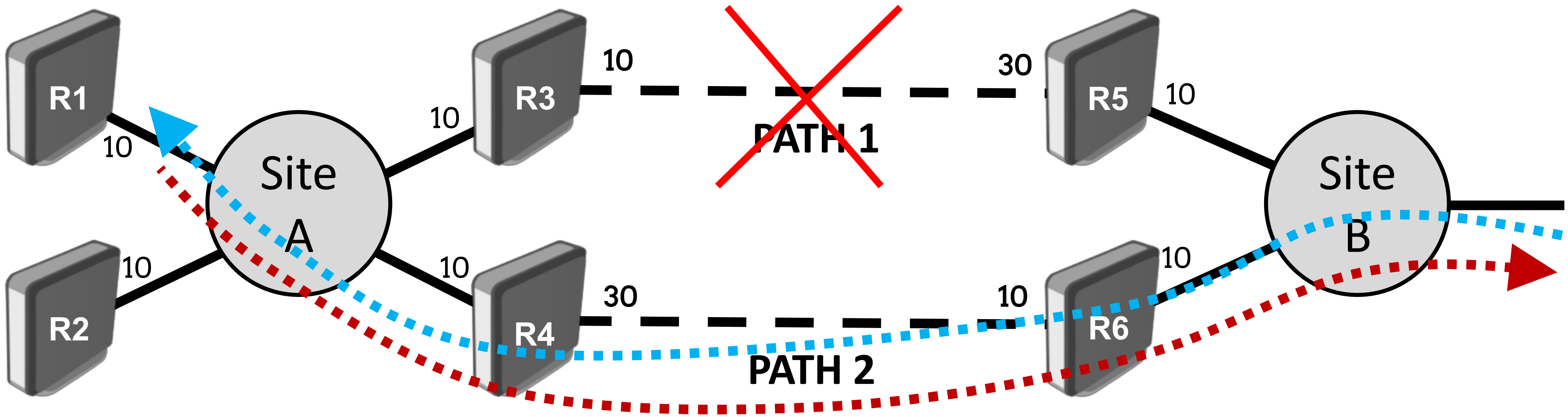
# OSPF Extra tips

## Another scenario: **load sharing upload/download**



# OSPF Extra tips

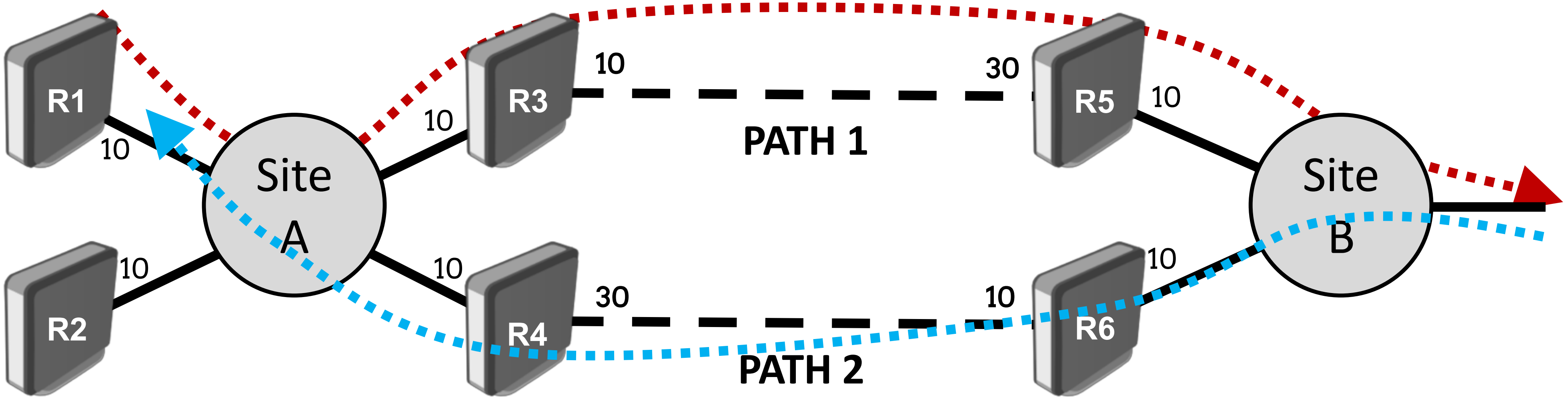
In case of failure all the traffic will use the active path only.



# OSPF Extra tips

**Pros**: using both paths

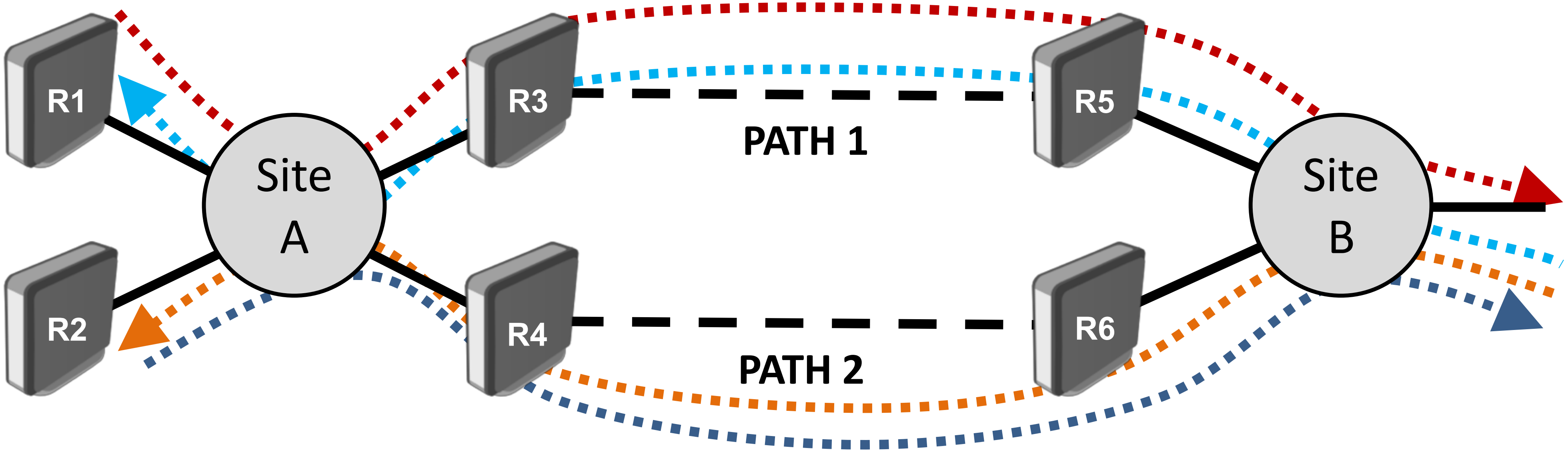
**Cons**: asymmetric traffic



# Is it possible to use two different OSPF paths for load sharing and redundancy?

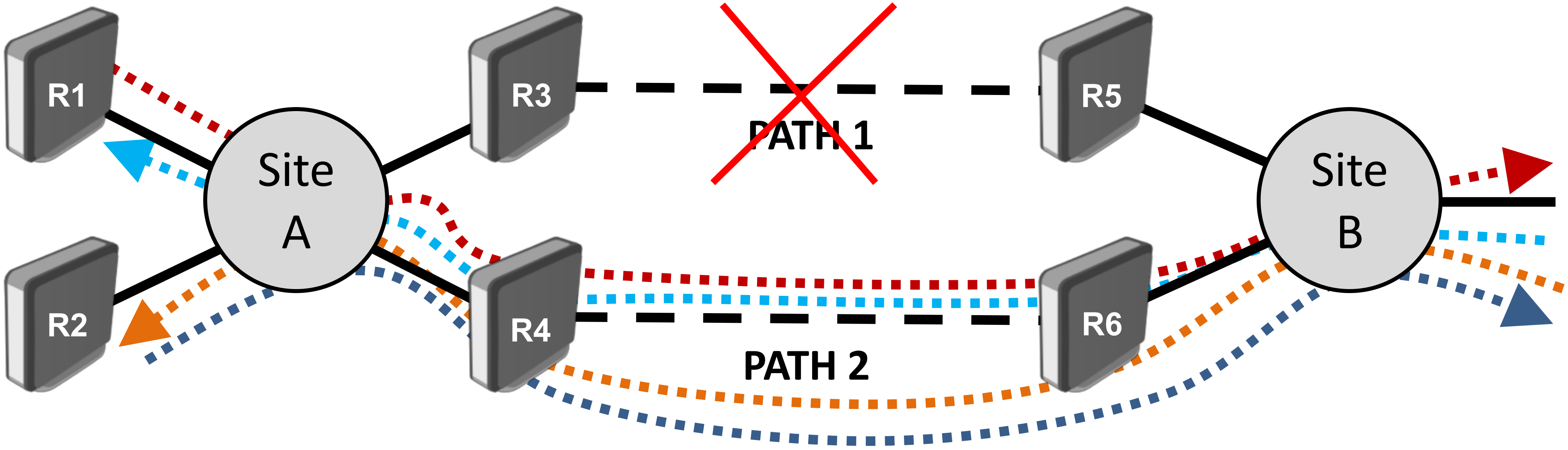
# OSPF Extra tips

Is it possible to use two different OSPF paths for “constrained” **load sharing** and redundancy?



# OSPF Extra tips

Is it possible to use two different OSPF paths for “constrained” load sharing **and redundancy**?



# Is it possible?

# OSPF Extra tips

The Dijkstra’s Algorithm will calculate the sum of the cost of the **output interfaces of each router of the full path**.

Having R1 and R2 with **only one output interface**, like ethernet for example, it is difficult to "steer" the traffic as we would like to.

# OSPF Extra tips

One solution can be to use multiple physical interfaces.

# OSPF Extra tips

One solution can be to use multiple physical interfaces.

**Like VLANs!**

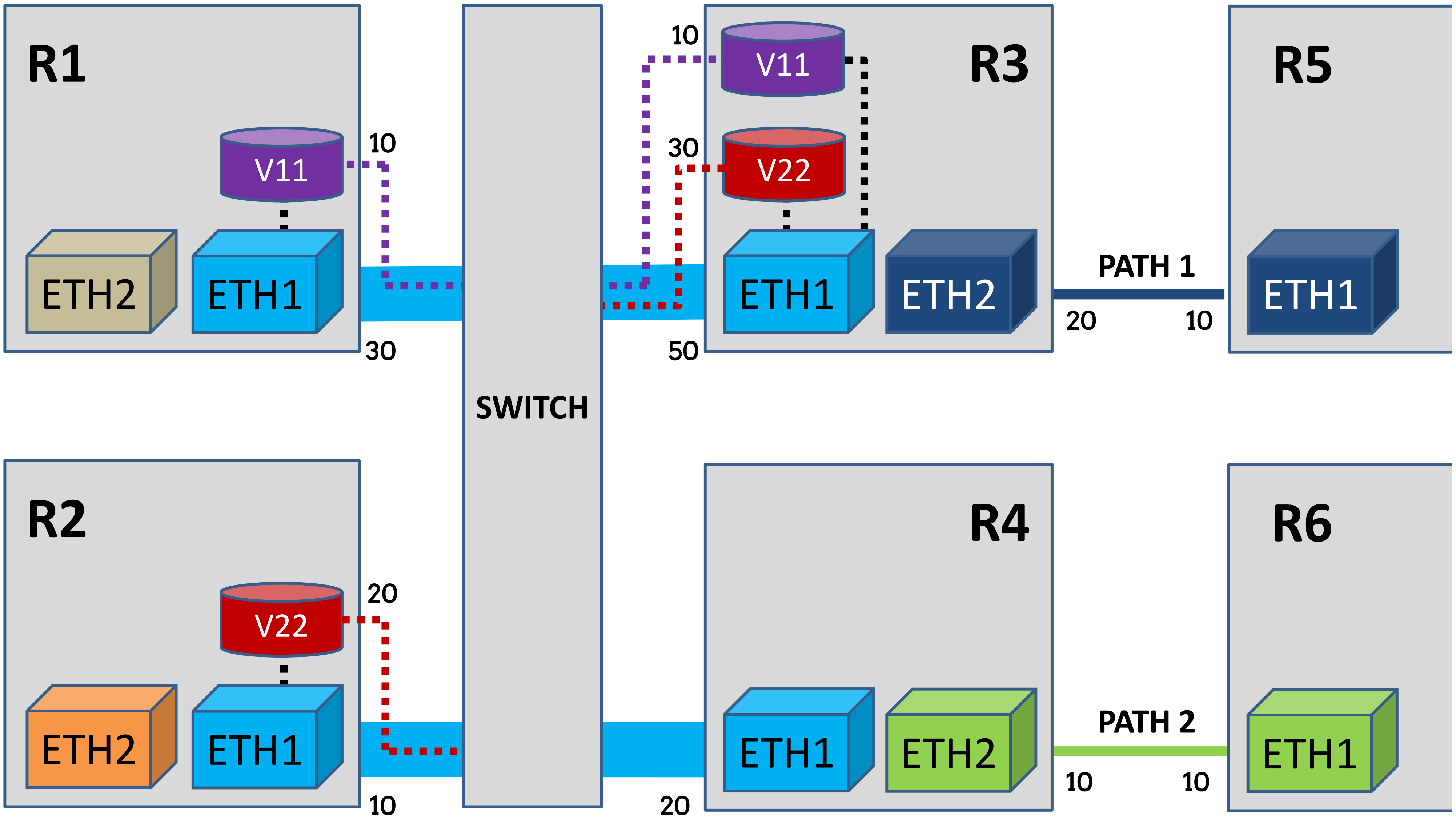
# OSPF Extra tips

We can use the VLANs to create multiple separate OSPF networks on different “physical output” interfaces.

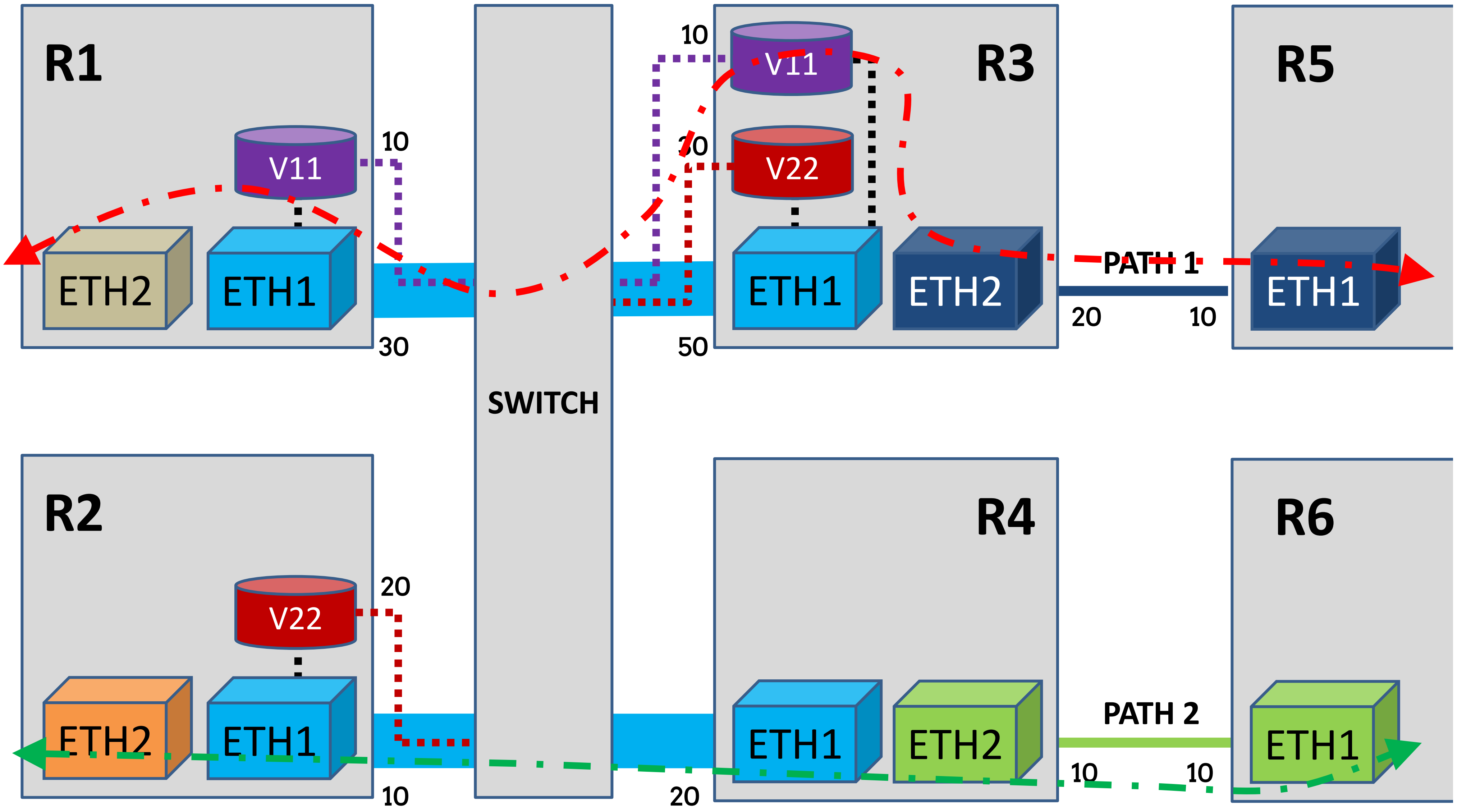
This way we can steer the traffic as we like to do!

*[I’ve often defined this as: think of “layers”]*

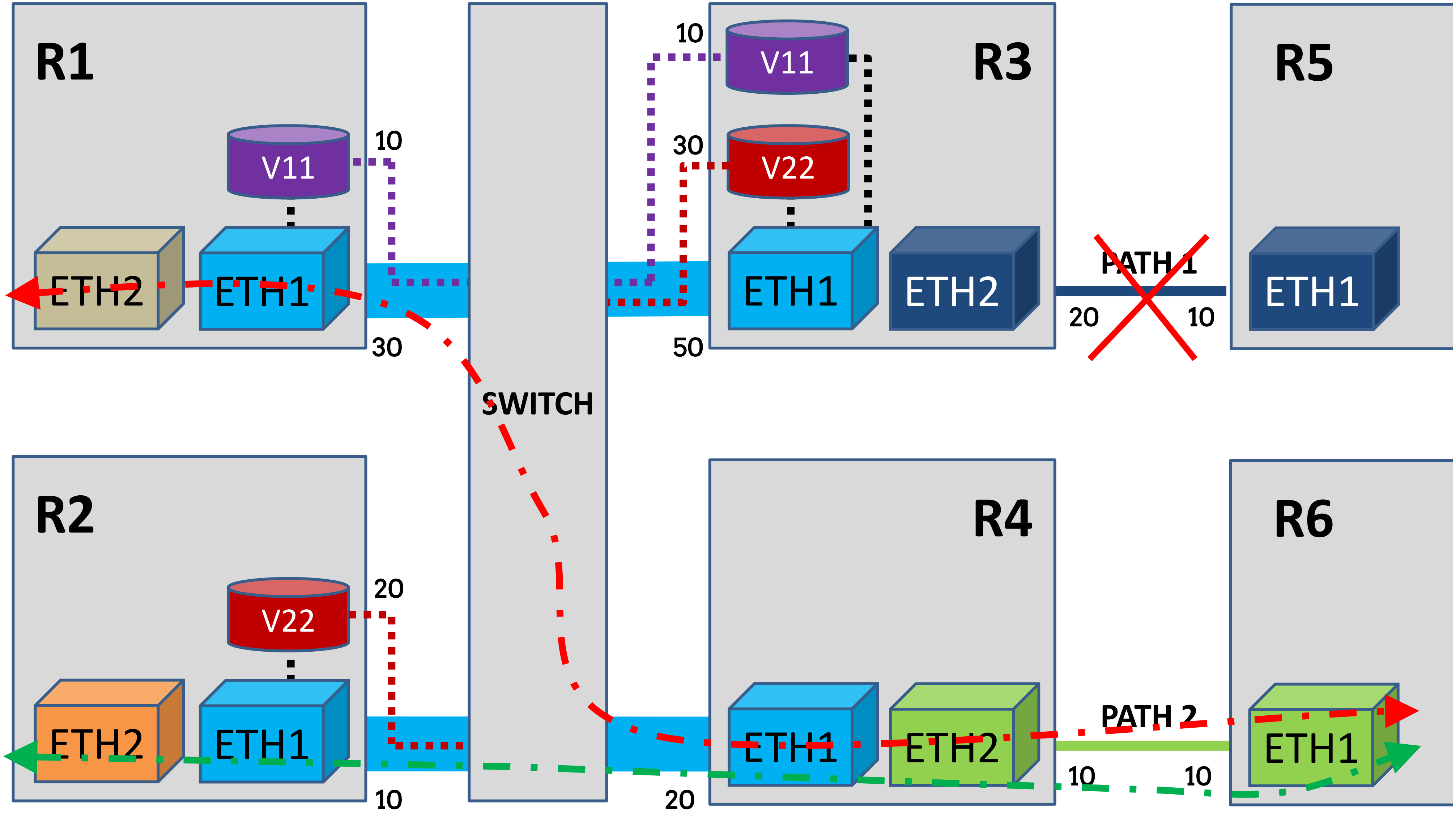
# The VLANs logic



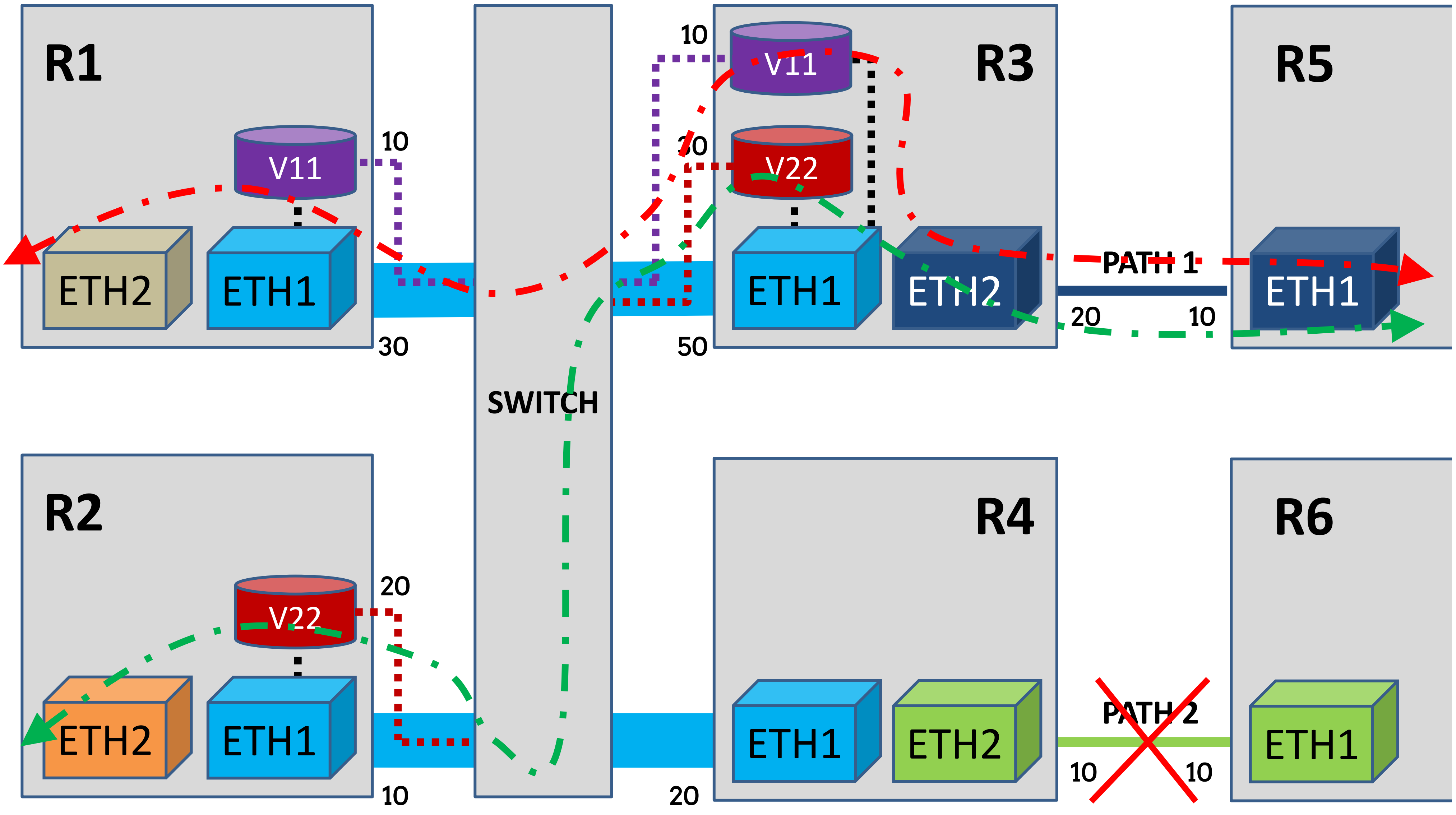
# The results: using both paths



# The results: failure of Path 1



# The results: failure of Path 2



# OSPF Extra tips

Using the “layers” of VLANs and OSPF networks you can engineer the traffic using ALL the paths (“main” and “backups”), avoid asymmetric traffic and using the same path from/to the same source.

# The OSPF “things”

# The OSPF “things”

The “OSPF World” is very interesting, this protocol can help you a lot for expanding your network: you have just to “know him well” before enabling 😁

I was not able to explain all the “things” that I planned to: they are too many for our the time slot and location today.

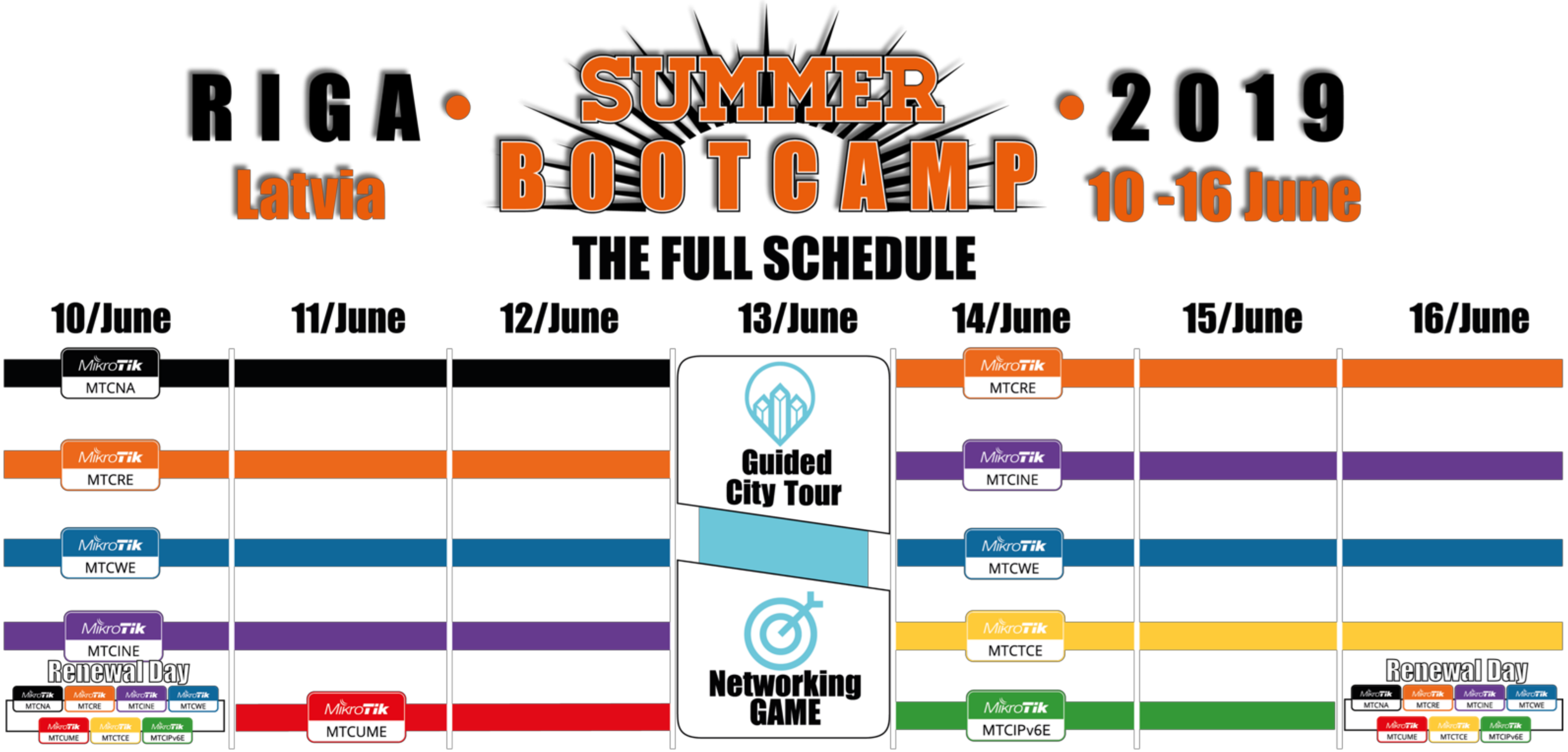
# The OSPF “things”

But here at the MUM you can talk with me and the other four MikroTik Trainers of the

# Wrap up

- ✓I hope you enjoyed my presentation
- ✓ learn or discover at least one thing about OSPF
- ✓*Use RouterOS as OSPF router!!!!*

# See you in Riga!



RIGA · SUMMER BOOTCAMP · 2019

Latvia

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THE FULL SCHEDULE

| 10/June | 11/June | 12/June | 13/June | 14/June | 15/June | 16/June |
|---|---|---|---|---|---|---|
| MikroTik<br>MTCNA | | | Guided City Tour | MikroTik<br>MTCRE | | |
| MikroTik<br>MTCRE | | | | MikroTik<br>MTCINE | | |
| MikroTik<br>MTCWE | | | | MikroTik<br>MTCWE | | |
| MikroTik<br>MTCINE | | | Networking GAME | MikroTik<br>MTCTCE | | |
| Renewal Day<br>MTCNA<br>MTCRE<br>MTCINE<br>MTCWE<br>MTCUME<br>MTCTCE<br>MTCIPv6E | MikroTik<br>MTCUME | | | MikroTik<br>MTCIPv6E | | Renewal Day<br>MTCNA<br>MTCRE<br>MTCINE<br>MTCWE<br>MTCUME<br>MTCTCE<br>MTCIPv6E |

# Thank you for listening!

# Q & A

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