Protocol Deep Dive: OSPF

COVERING OSPF BASICS

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Course Overview

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Covering OSPF Basics

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Forming Basic OSPF Relationships

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Discussing Simple OSPF Communication Blocks

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Introducing Multi-area OSPF

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Troubleshooting Common OSPF Issues

Module Overview

Module Overview

OSPF vs. Other Routing Protocols

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OSPF vs. Other Routing Protocols

Reviewing the OSPF Metric

Module Overview

OSPF vs. Other Routing Protocols

Reviewing the OSPF Metric

Selecting the Best Route Entry

Let’s review the basics

OSPF Basics

Interior gateway protocol (IGP)

OSPF Basics

Controls traffic inside a single organization

OSPF Basics

Other IGP's Include:

EIGRP

OSPF Basics

Other IGP's Include:

- IS-IS

Exterior Gateway Protocols

Alternative of IGPs

Exterior Gateway Protocols

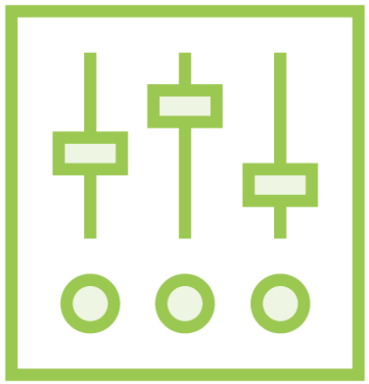
Alternative of IGPs

Control traffic
between organizations

Exterior Gateway Protocols

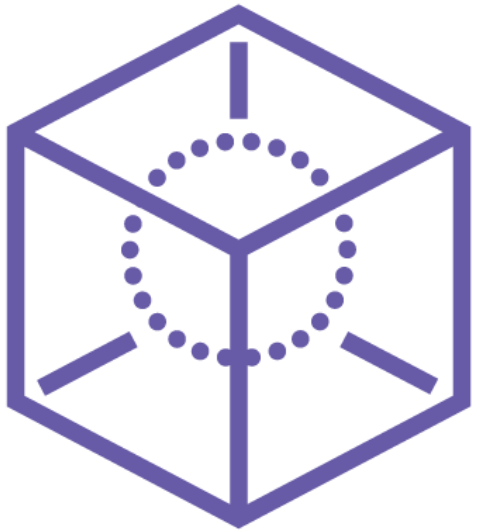
Alternative of IGPs

Control traffic between organizations

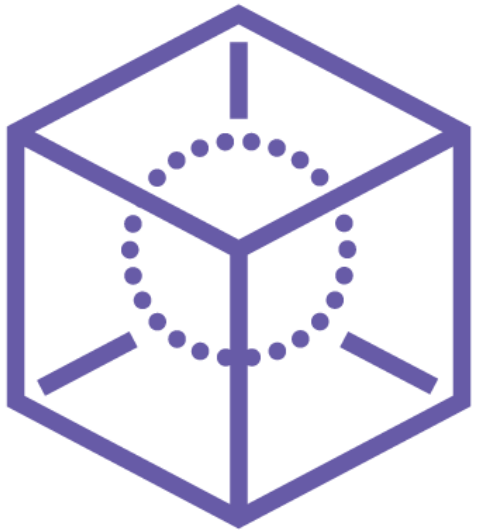


BGP the only current option

Interior Gateway Protocols

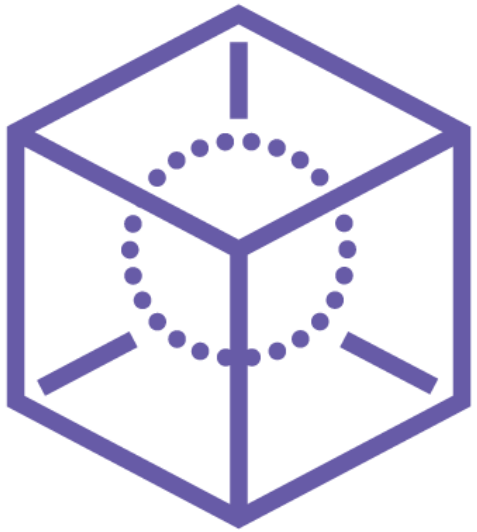


Interior Gateway Protocols



Two types including:

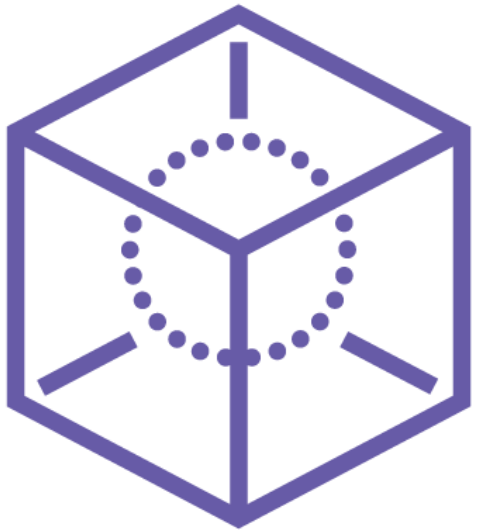
Interior Gateway Protocols



Two types including:

- Distance vector

Interior Gateway Protocols



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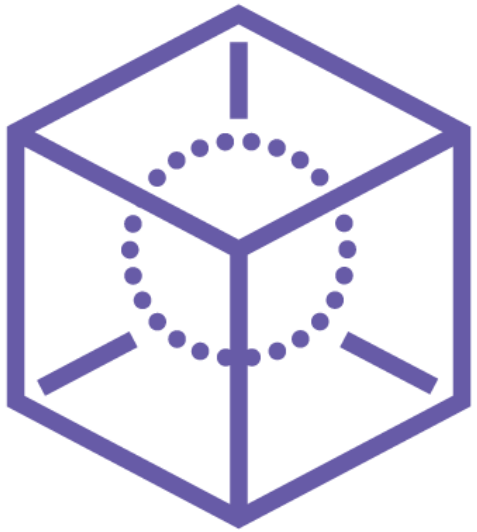

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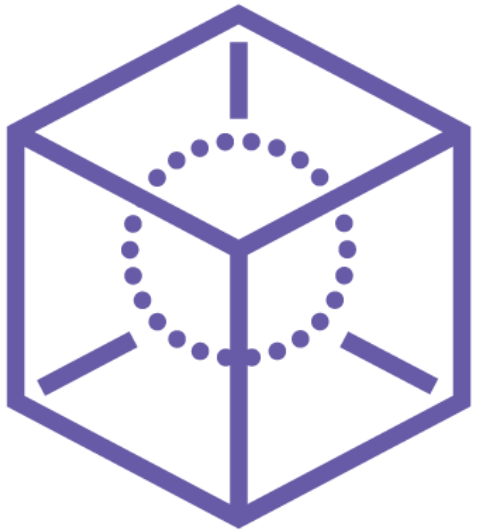
Distance vector:

Exchange distance (metric) and vector (direction)

Interior Gateway Protocols



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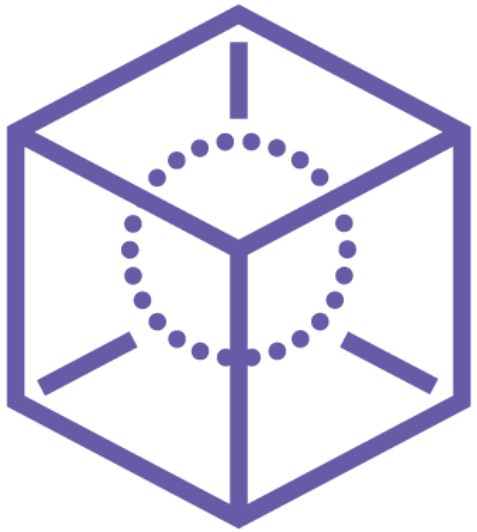

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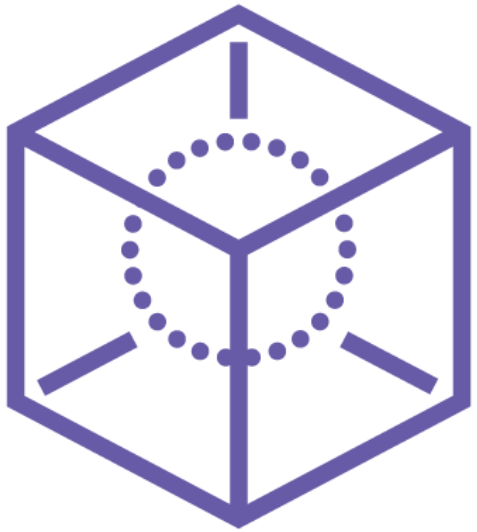

Two types including:

- Distance vector
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Distance vector:

Exchange distance (metric) and vector (direction)

Devices route based on this information

Based on currently reachable destinations from neighbors

Devices have limited view

Link State Protocols

Link State Protocols

Exchange state of all network links

Link State Protocols

Exchange state of all network links

Each device includes complete copy of link states

Link State

Updates are appended to link state database (LSDB)

Link State

Each device will have same LSDB

Link State

Have better view of network

Link State

More complex than distance vector

Link State

OSPF is an example

OSPF

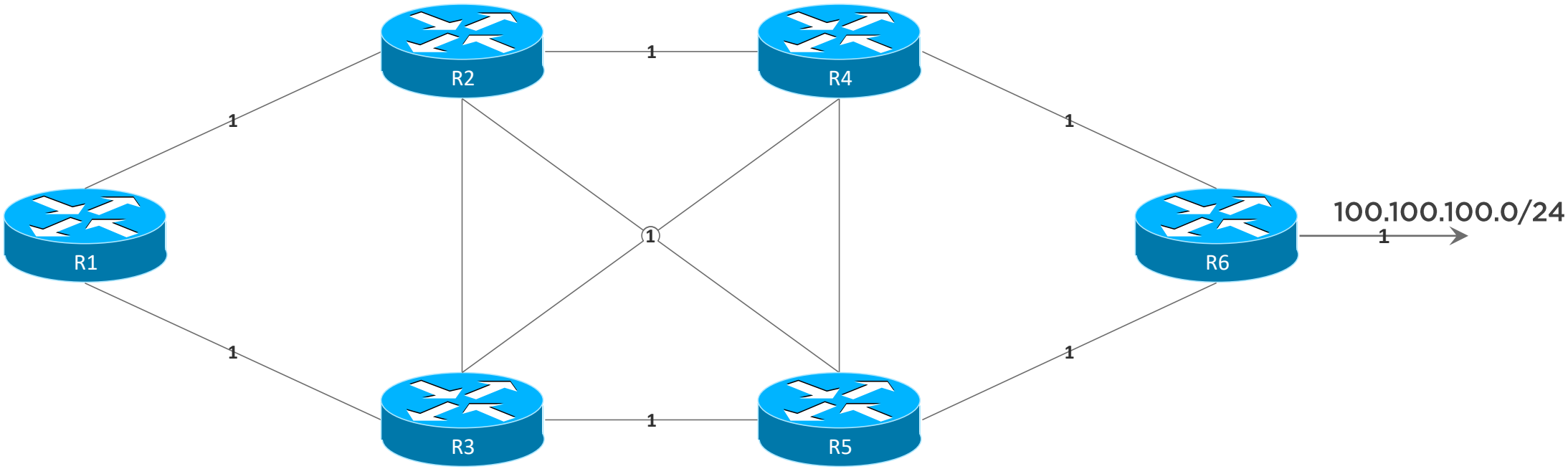
Uses link state advertisements (LSA)

OSPF

Uses link state advertisements (LSA)

Used with SPF to determine routes used

Course Topology – Simple Metrics



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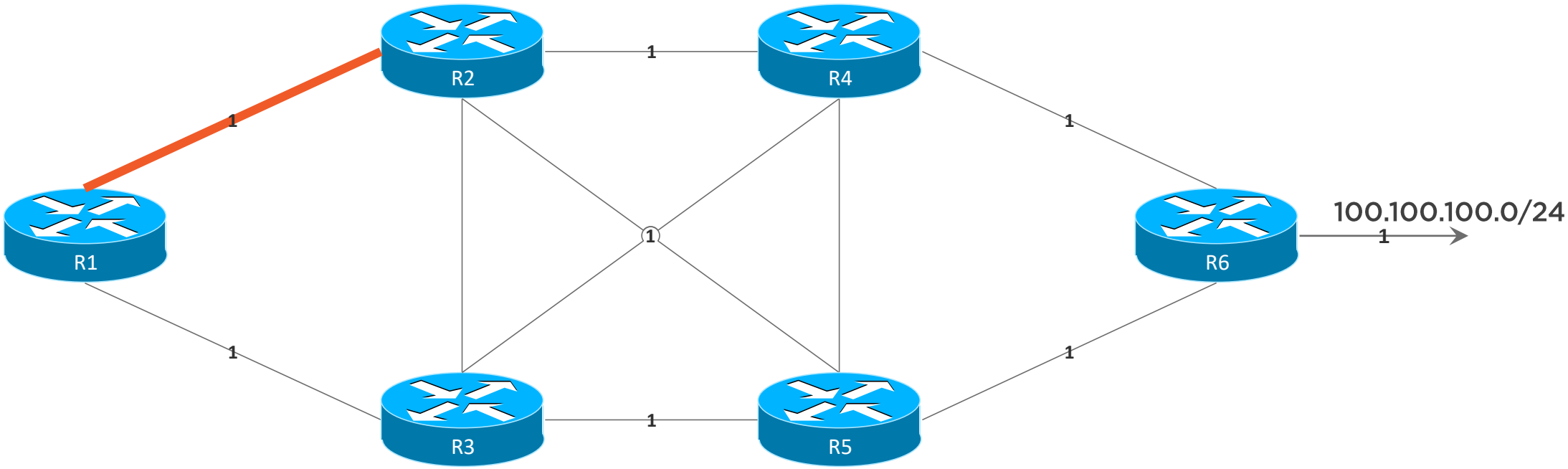

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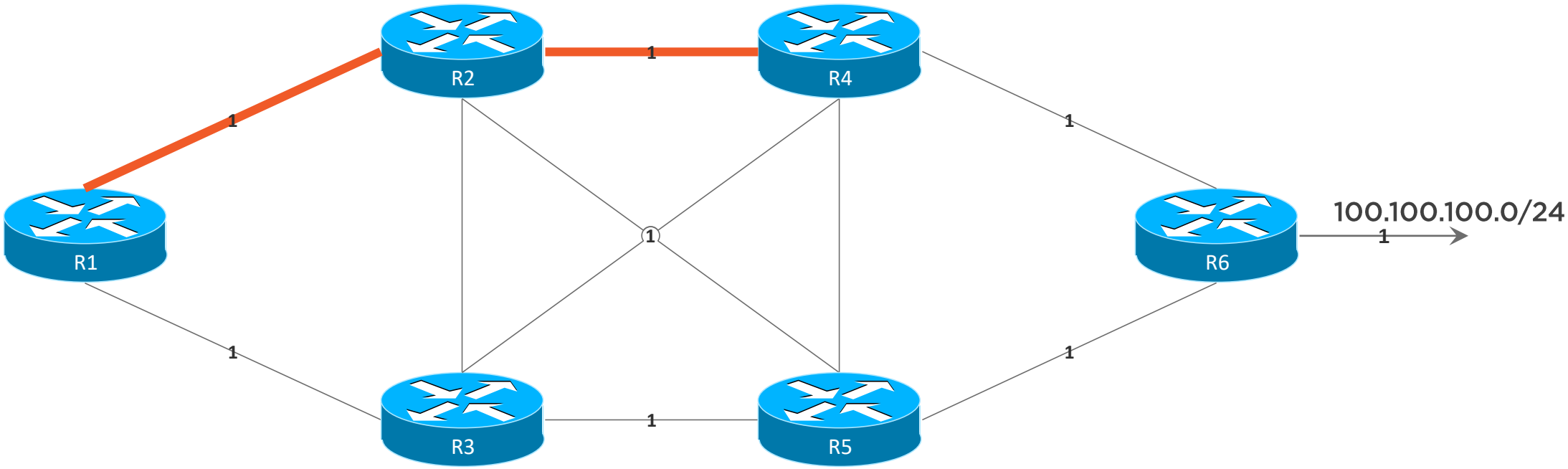

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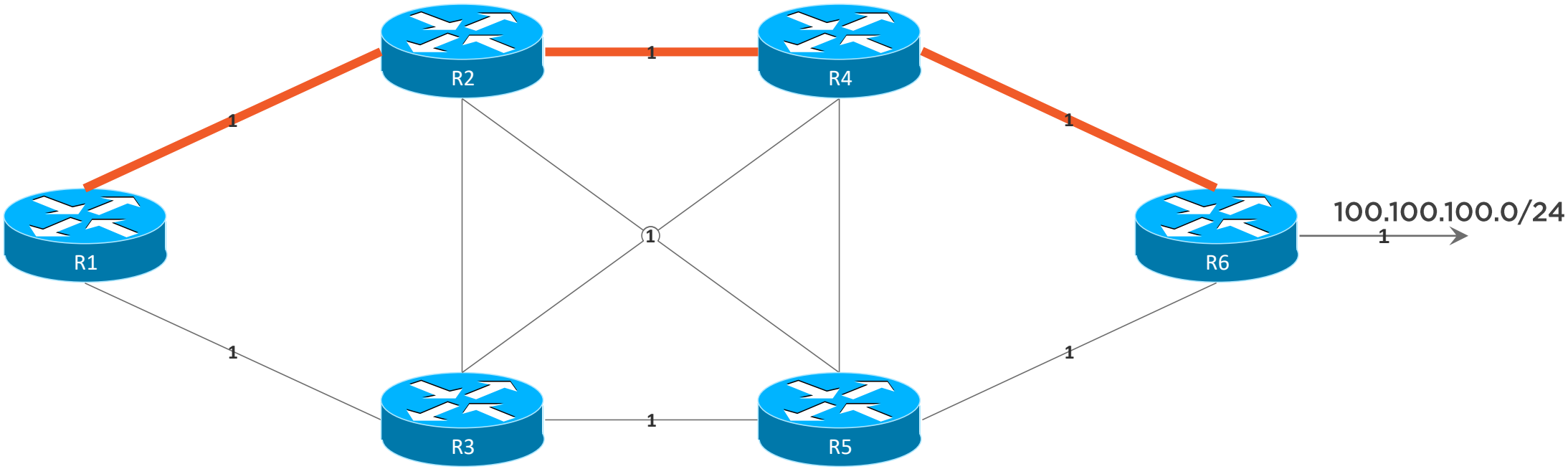

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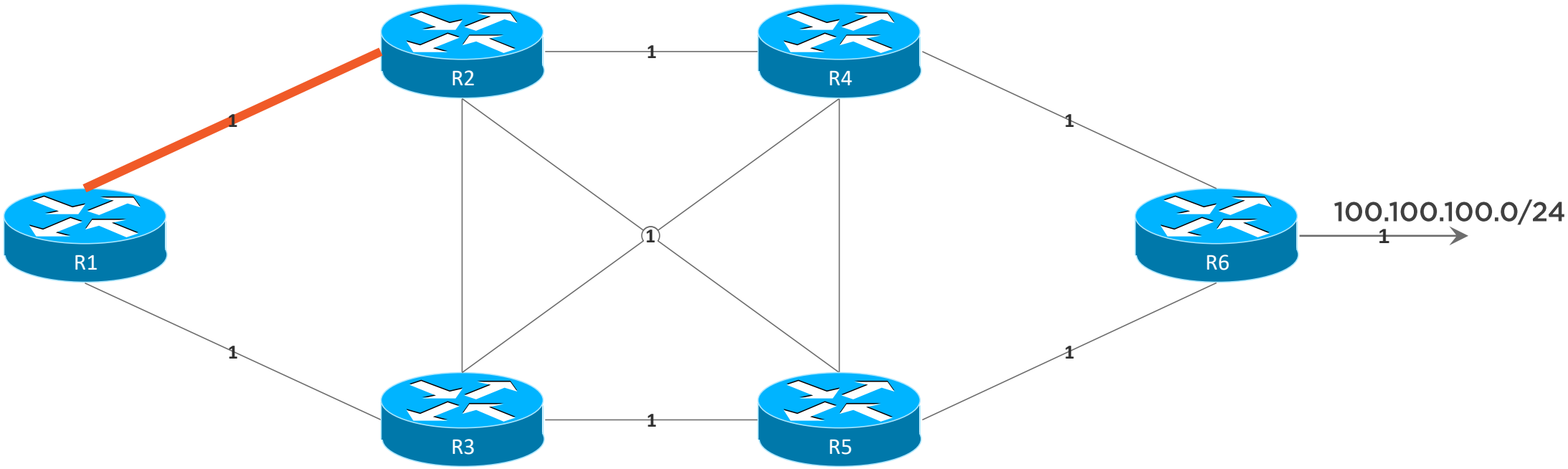

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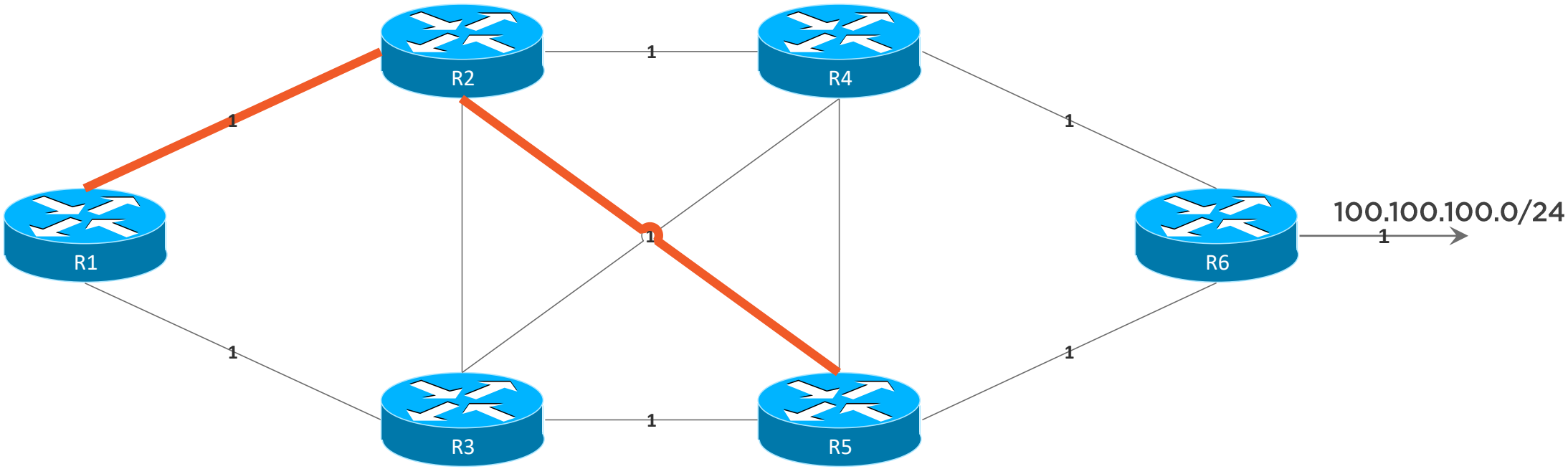

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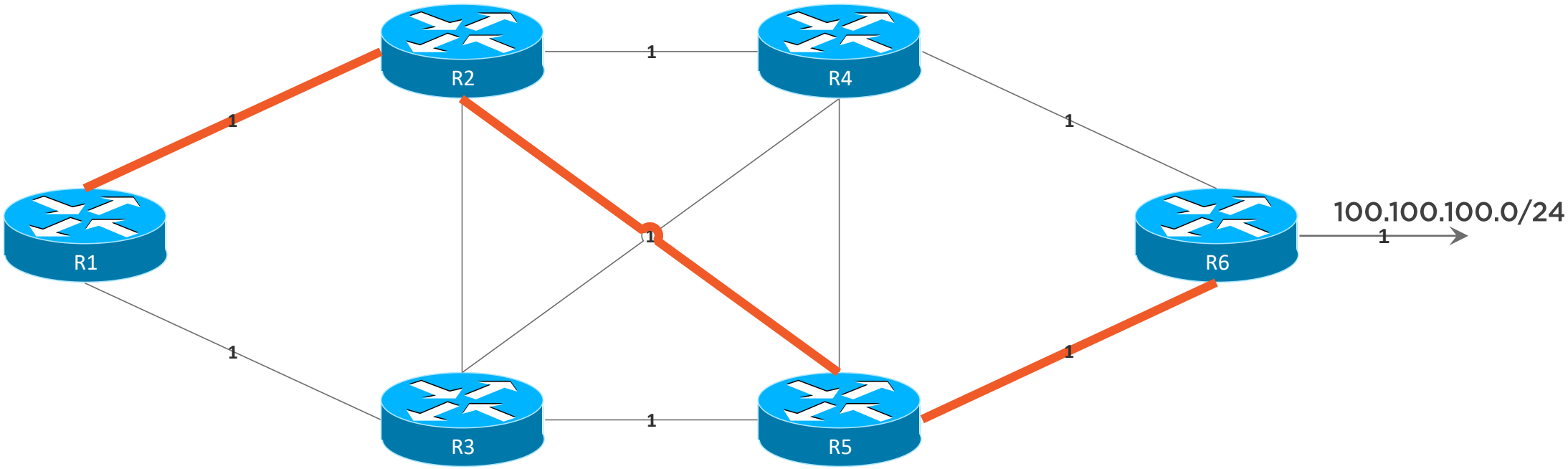

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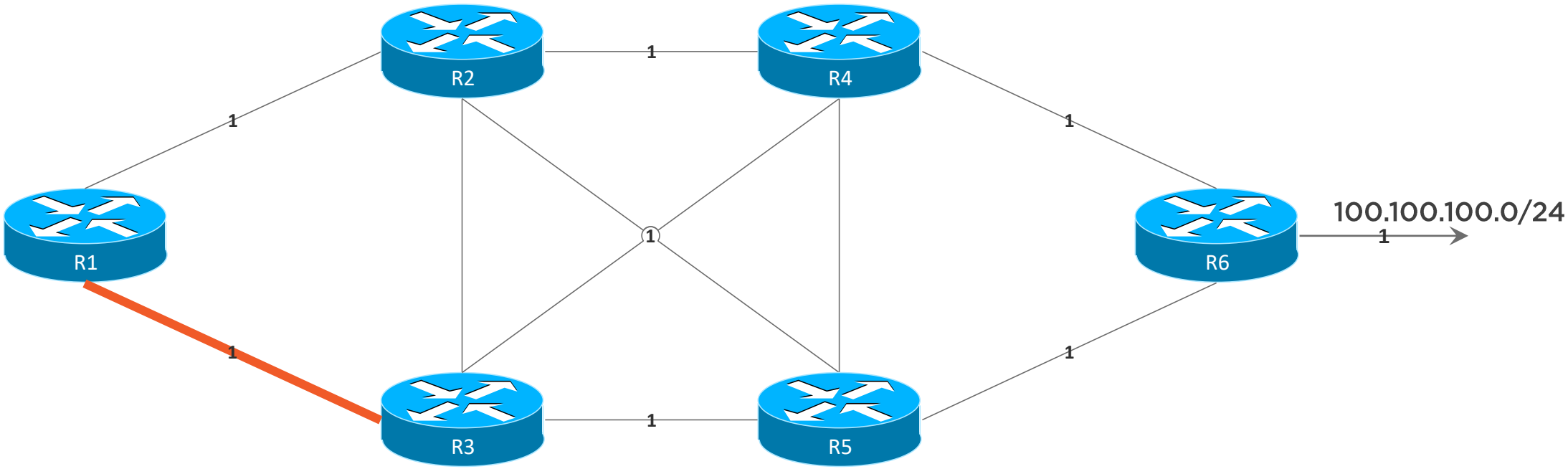

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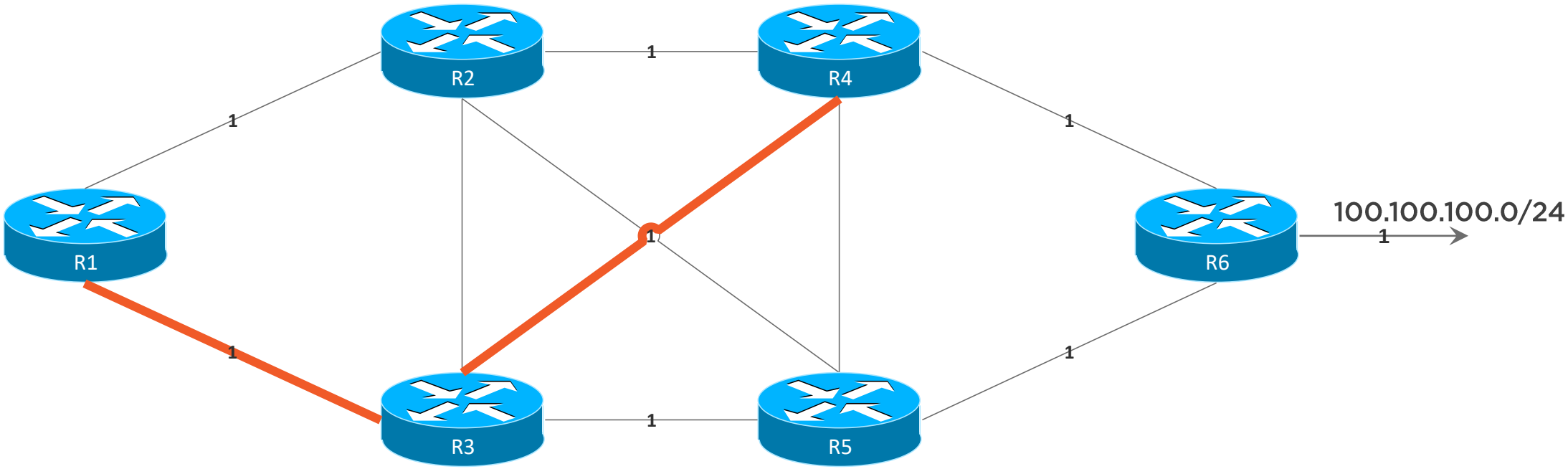

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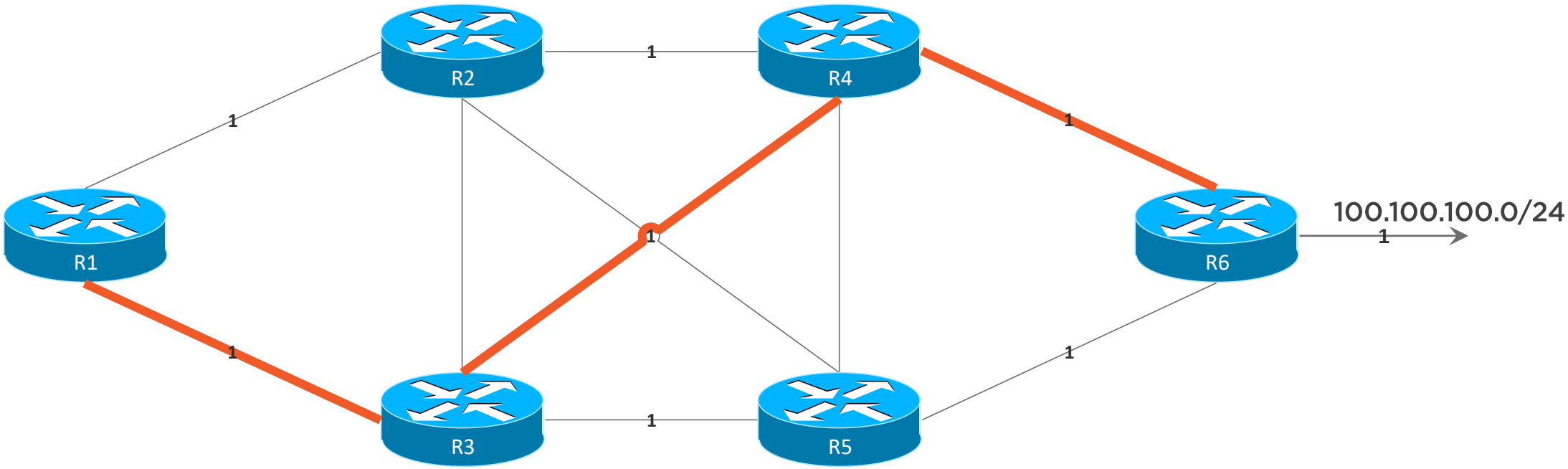

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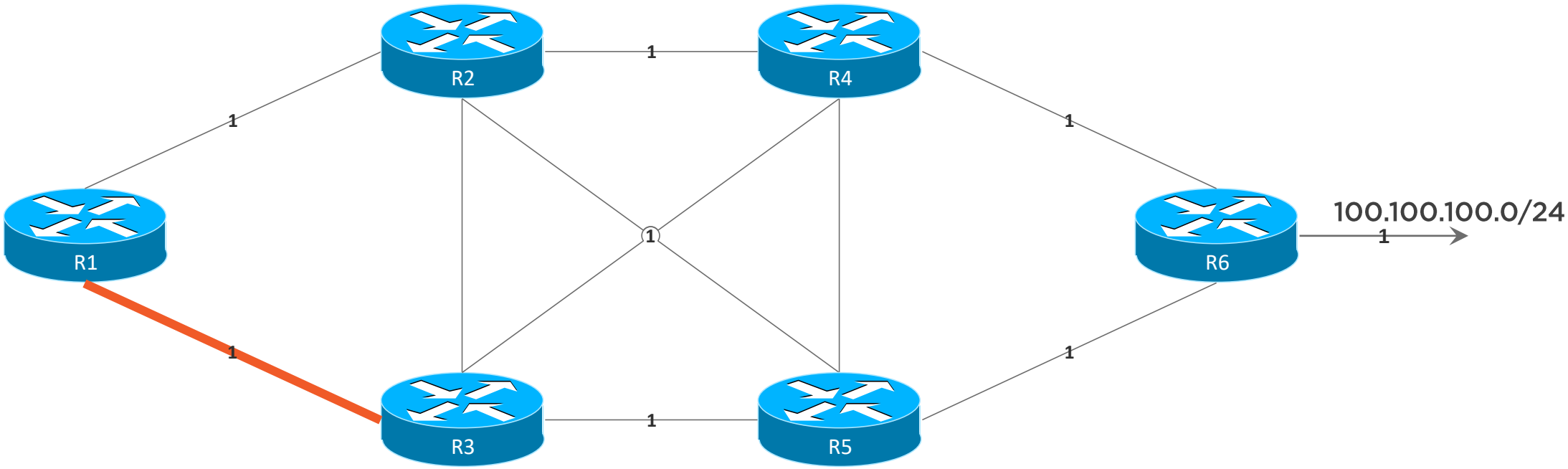

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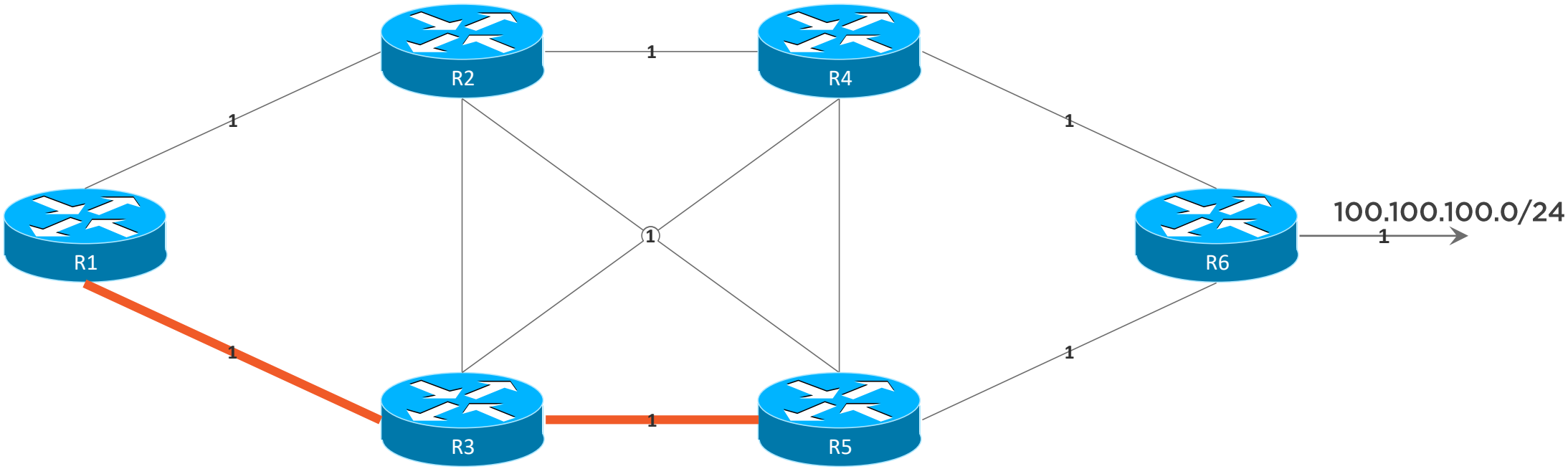

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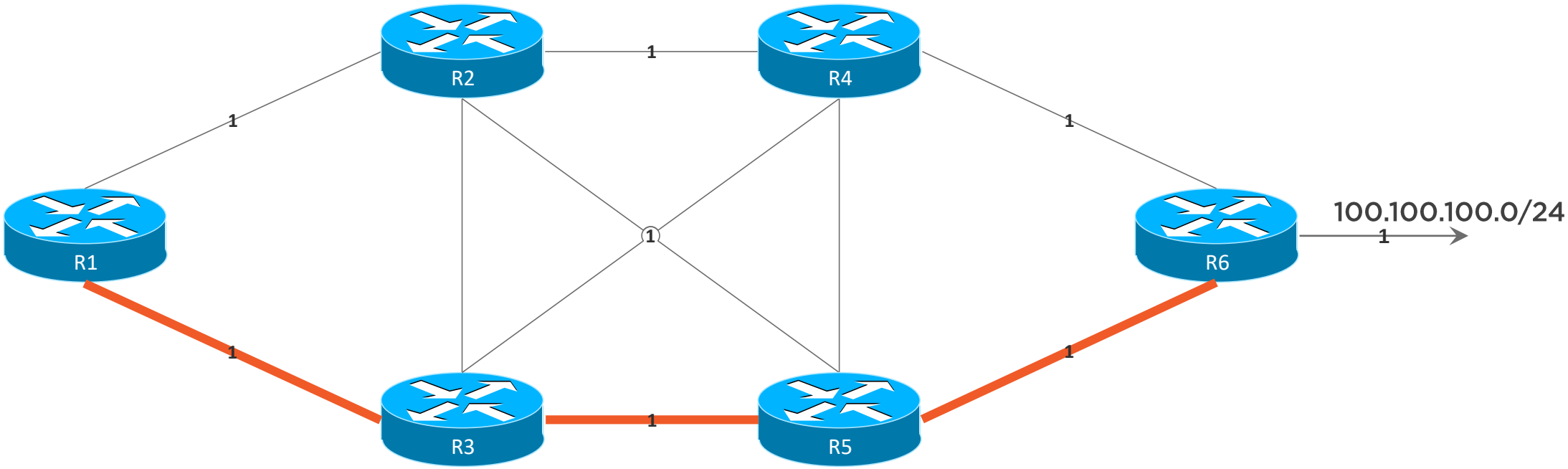


OSPF Metric

Simple metric

OSPF Metric

Simple metric

Based on configured bandwidth

OSPF Metric

Simple metric

Based on configured bandwidth

$$\frac{\text{Reference bandwidth}}{\text{Configured bandwidth}}$$

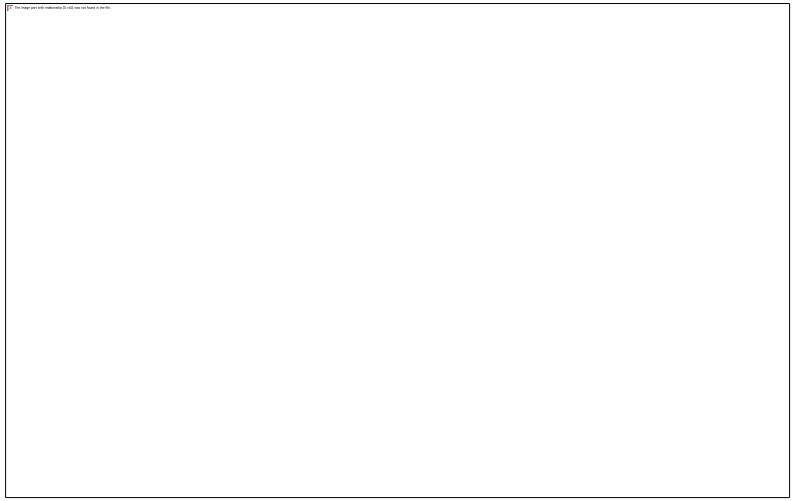
OSPF Metric

Simple metric

Based on configured bandwidth

$$\frac{\text{Reference bandwidth}}{\text{Configured bandwidth}}$$

Cost associated with outbound link



Default reference bandwidth is 100 Mbps

Default reference bandwidth is 100 Mbps

$$\frac{100\ Mbps}{10\ Mbps} = 10$$

OSPF Metric

Most interfaces are > 100 Mbps

OSPF Metric

100 Mbps interface = Cost of 1

OSPF Metric

1 Gbps interface =
Cost of 1

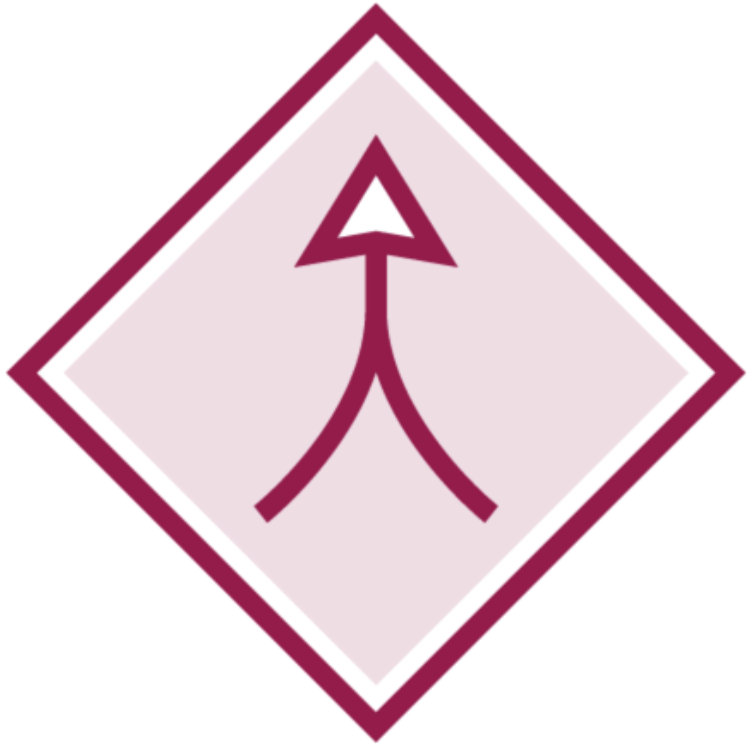
OSPF Reference Bandwidth

Faster interfaces have the same cost

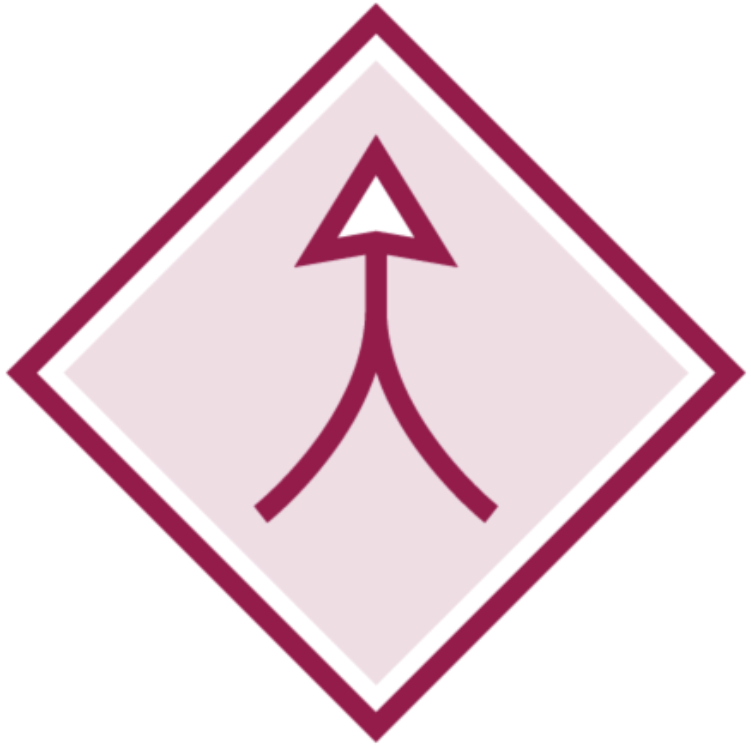
OSPF Reference Bandwidth

Faster interfaces have the same cost

Often results in higher reference bandwidth

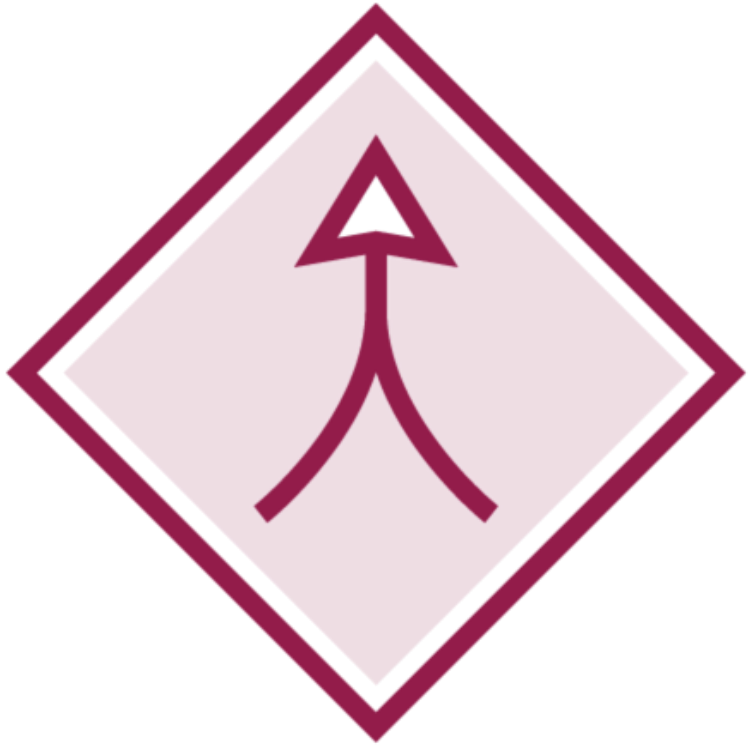


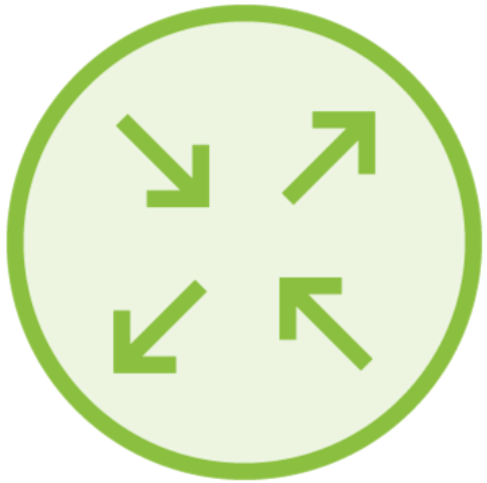
Rounding up is limited to between 0 and 1



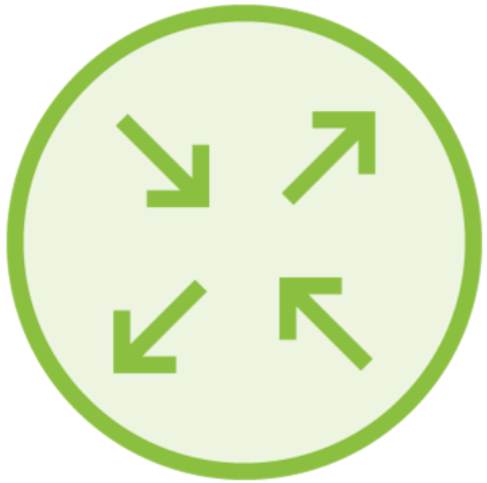
Rounding up is limited to between 0 and 1

OSPF normally rounds down to the whole number



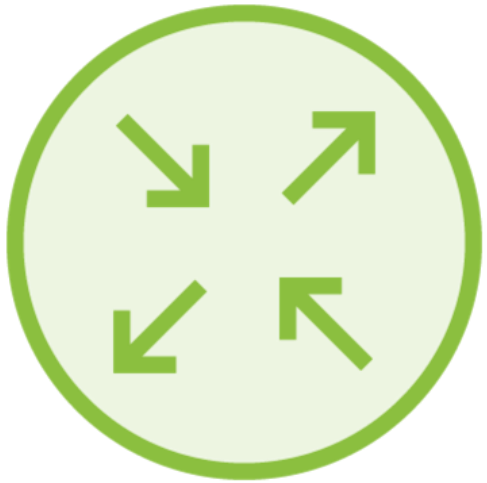


OSPF External Routes



OSPF External Routes

Routes taken from other sources



OSPF External Routes

Routes taken from other sources

Referred to as redistribution

OSPF External Routes

Two types:

OSPF External Routes

Two types:

Type 1

Type 2 (Default)

OSPF External Routes

Type 2:

Metric given initially then locked

OSPF Type 1 External Routes

Initial metric is given

OSPF Type 1 External Routes

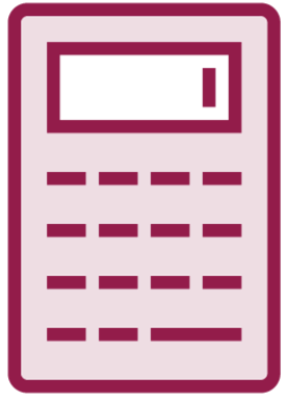
Initial metric is given

Used as base value

OSPF Type 1 External Routes

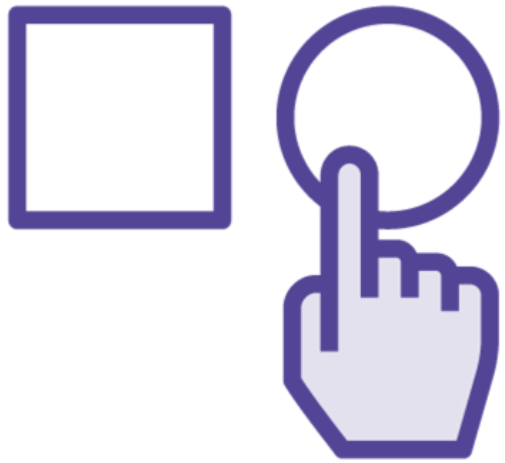
Initial metric is given

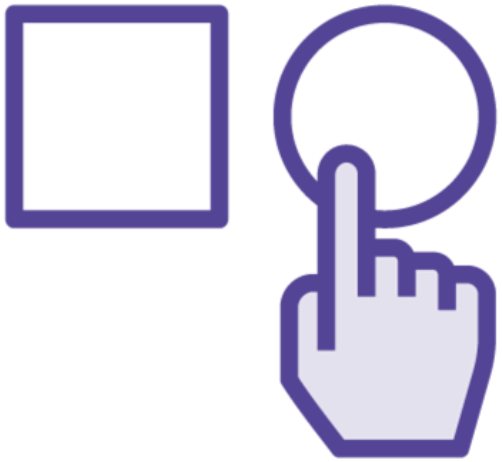
Used as base value



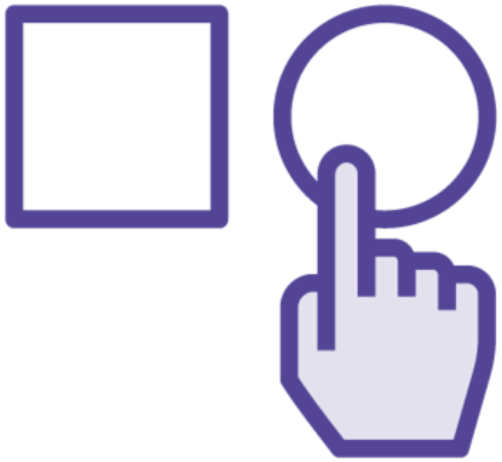
Incremented like normal OSPF costs

Route Selection!





Many vendors use administrative distance

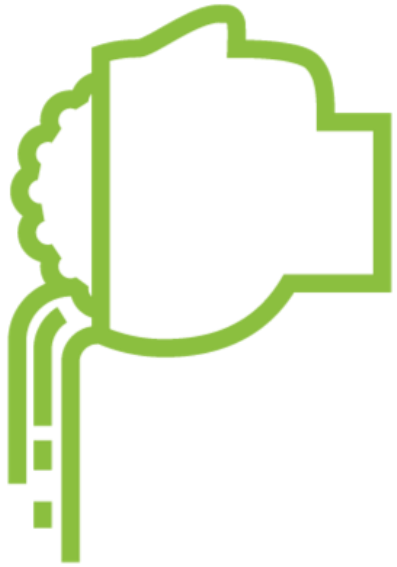


Many vendors use administrative distance

Used to determine source preference

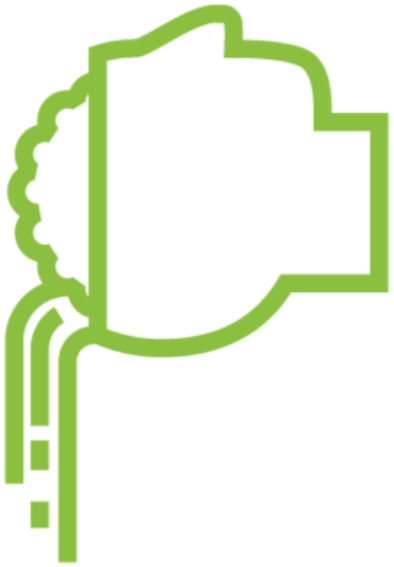
Source	Administrative Distance
Connected	0
Static	1
eBGP	20
EIGRP (internal)	90
OSPF	110
IS-IS	115
RIP	120
EIGRP (external)	170
iBGP	200

OSPF has its own
route selection process



OSPF has its own
route selection process

Some context must be given first



OSPF Hierarchy

Uses areas

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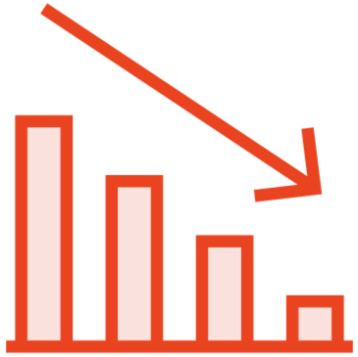
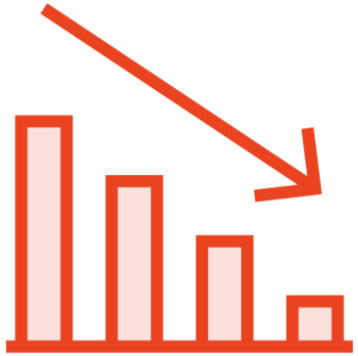


Used to limit size of LSDB

OSPF Hierarchy

Uses areas



Used to limit size of LSDB

Several types exist

OSPF Areas

Several differences exist

OSPF Areas

Specifics will be covered in later module

Intra-Area Entries

Intra-Area Entries

Routes sourced inside same area

Intra-Area Entries

Routes sourced inside same area

Preferred over all other OSPF sources

Inter-Area Entries

Inter-Area Entries

Sourced from other OSPF area

Inter-Area Entries

Sourced from other OSPF area

Preferred after intra-area entries

External entries only considered if internal entries don't exist

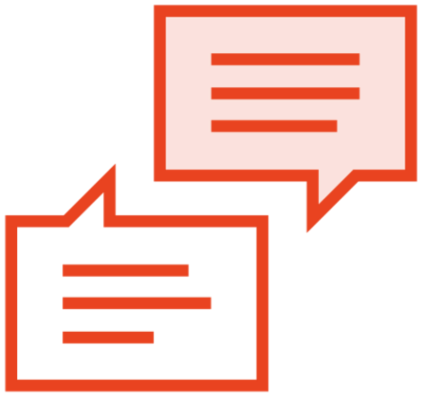
OSPF External Entries

Type 1/Type 2

OSPF External Entries

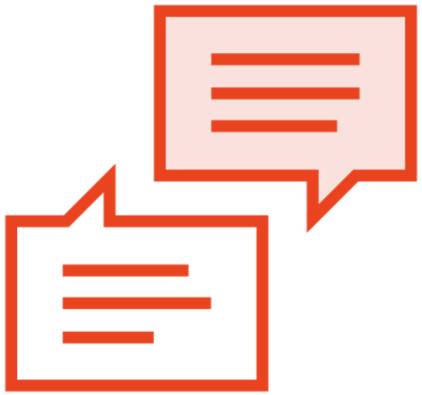
Type 1 entries preferred over type 2 entries

NSSA External Entries



Type 1 and Type 2

NSSA External Entries



Type 1 and Type 2

NSSA type 1 preferred over NSSA type 2

OSPF Route Selection

- Intra-Area (O)
- Inter-Area (O IA)
- External Type 1 (E1)
- External Type 2 (E2)
- NSSA Type 1 (N1)
- NSSA Type 2 (N2)

Summary

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OSPF vs. Other Routing Protocols

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Selecting the Best Route Entry