



AT&T

OSPF Range Cost Addendum

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Supporting AT&T Vyatta Network Operating System

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About This Guide

This addendum describes the OSPF Range Cost feature that was added to Release 17.2.0 of the AT&T Vyatta vRouter (referred to as a virtual router, vRouter, or router in the guide). The document to which this guide is an addendum is the Vyatta *Basic Routing Configuration Guide*, Release 17.2.0.

Features	vRouter Release	Rev of Services Configuration Guide 5600 Addendum	Date
OSPF Range Cost	1801	1	April 2019
OSPF Range Cost	1801	2	April 2019
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OSPF Range Cost Addendum

In Release 1801, AT&T added support for the assignment of a cost to area summary routes. This document is an addendum to the Vyatta *Basic Routing Configuration Guide*, 17.2.0.

Introduction

This feature lets you assign a fixed cost to area summary routes in OSPFv2 (IPv4) and OSPFv3 (IPv4 and IPv6), including routing instances.

Area Border Routers (ABRs) can advertise a summary route instead of individual routes that originate within an AS. This feature lets you specify a fixed cost to advertise along with the summary route. If a fixed cost is not specified, the cost of the summary route is the maximum cost of all the individual routes that are in the summary route.

This feature applies to inter-AS summary routes (configured through the **area range** command), described in this addendum. It does not apply to external routes that are redistributed into OSPF.

Behavior with Range Cost Configuration

Use of this feature entails an optional override of routing costs. When configured, the fixed cost replaces (overrides) the calculated cost.

If you do not configure a cost for the summary route, then the cost is calculated automatically as the maximum cost of all the individual routes that are covered by the summary. If you do configure a cost, this overrides that automatic calculation.

Configuring a fixed cost metric for an area summary range is significant only when the range is advertised to peers. For example, if the range is configured as **not-advertise** or if no path matches the range, it is not advertised.

The range's configuration can include the **not-advertise** parameter. If **not-advertise** is specified:

- No prefixes that match the range are advertised.
- The range itself is not advertised.
- Any configured cost for the range is meaningless and is ignored.
- If the **not-advertise** condition is subsequently removed, any fixed-cost configuration is applied.

Furthermore:

- If no prefixes are matched in the range configuration, the range is not advertised.

- If one or more prefixes *do* match the range, the whole range is advertised instead of just the matching prefixes (unless the range is configured with **not-advertise**).

Any change in the cost configuration (adding a cost, removing the cost, or changing the cost value) causes OSPF to send the new cost in an update to its peers.

Examples of Operational Mode Commands

For OSPF range cost, the existing commands can be used to verify that the correct metric is being advertised. This section contains an example for OSPFv2 and OSPFv3 (IPv6).

OSPFv2 Example

For this example, the **show** command displays the summary LSAs that originated in the router.

Syntax

show ip ospf database summary self-originate

In this example, the output shows that the summary LSA for 10.64.0.0/10 has metric 99.

```
vyatta@vm-yv-3:~$ show ip ospf database summary self-originate
```

```
LS age: 572
```

```
Options: 0x22 (-|-|DC|-|-|-|E|-)
```

```
LS Type: Summary-LSA
```

```
Link State ID: 10.64.0.0 (summary Network Number)
```

```
Advertising Router: 3.3.3.3
```

```
LS Seq Number: 8000000b
```

```
Checksum: 0x7a3e
```

```
Length: 28
```

```
Network Mask: /10
```

```
TOS: 0 Metric: 99
```

OSPFv3 Example

For this IPv6 example, the **show** command displays the summary LSAs originated by a router.

Syntax

show ipv6 ospfv3 database inter-prefix self-originate

This example shows that the inter-area prefix LSA for 10:100::/30 has metric 99.

```
LS age: 705
LS Type: Inter-Area-Prefix-LSA
Link State ID: 0.0.0.1
Advertising Router: 3.3.3.3
LS Seq Number: 0x8000000B
Checksum: 0x2C65
Length: 32
  Metric: 99
  Prefix: 10:100::/30
  Prefix Options: 0
```

Configuration Data Model

OSPFv2 Area Range

This command overrides the default cost metric that was calculated to be the maximum metric among the prefixes that match the range. The cost is meaningless and ignored if **not-advertise** is configured for the specified range.

Syntax

```
set protocols ospf [ process <process-ID> ] area <area-ID> range <IPv4-prefix> metric <0..16777214>
```

where the value for **metric** is a 24-bit, unsigned integer.

OSPFv2 Routing Instance Area Range

This command overrides the calculated default metric for a specific OSPFv2 routing instance. (The calculated default metric is calculated to be the maximum metric among the prefixes that match the range.) The cost is meaningless and ignored if **not-advertise** is configured for the specified range.

Syntax

```
Set routing routing-instance <instance-name> protocols ospf [ process <process-ID> ] area <area-ID> range <IPv4-prefix> metric <0..16777214>
```

where the value for **metric** is a 24-bit, unsigned integer.

OSPFv3 Area Range

This command lets you configure a metric to override the calculated default metric for a specific OSPFv3 routing instance. (The calculated default metric is calculated to be the maximum metric among the prefixes that match the range.) The cost is meaningless and ignored if **not-advertise** is configured for the specified range.

Syntax

```
set protocols ospfv3 [ <process-name> ] area <area-ID> range <IPv6-prefix> metric <0..16777214>
```

where the value for **metric** is a 24-bit, unsigned integer.

OSPFv3 Routing Instance Area Range

This command overrides the calculated default metric for a specific routing instance. (The calculated default metric is calculated to be the maximum metric among the prefixes that match the range.) The cost is meaningless and ignored if **not-advertise** is configured for the specified range.

Syntax

```
set routing routing-instance <instance-name> protocols ospfv3 <process-name> area <area-ID>  
range <IPv6-prefix> metric <0..16777214>
```

where the value for **metric** is a 24-bit, unsigned integer.

OSPFv3 IPv4 Area Range

This command overrides the calculated default metric in an IPv4 unicast area. (The calculated default metric is calculated to be the maximum metric among the prefixes that match the range.) The cost is meaningless and ignored if **not-advertise** is configured for the specified range.

Syntax

```
set protocols ospfv3 process <process-name> address-family ipv4 unicast area <area-ID> range  
<IPv4-prefix> metric <0..16777214>
```

where the value for **metric** is a 24-bit, unsigned integer.

OSPFv3 Routing Instance IPv4 Area Range

This command overrides the default metric that was calculated to be the maximum metric among the prefixes that match the range. The cost is meaningless and ignored if **not-advertise** is configured for the specified range.

Syntax

```
set routing routing-instance <instance-name> protocols ospfv3 process <process-name> address-  
family ipv4 unicast area <area-ID> range <IPv4-prefix> metric <0..16777214>
```

where the value for **metric** is a 24-bit, unsigned integer.

Detailed Examples

This section contains detailed configuration examples for OSPFv2 and OSPFv3.

OSPFv2 Example

An area border router (ABR) has an interface *dp0pls1* in area 0 and interfaces *dp0pls2.100*, *dp0pls2.101*, and *dp0pls2.102* in area 1. This ABR is summarizing a range 10.64.0.0/10 from area 1 into area 0.

It has the following configuration:

```
set interfaces dataplane dp0pls1 address '10.10.3.3/24'
set interfaces dataplane dp0pls2 vif 100 address '10.100.4.3/24'
set interfaces dataplane dp0pls2 vif 100 ip ospf cost '10'
set interfaces dataplane dp0pls2 vif 101 address '10.101.4.3/24'
set interfaces dataplane dp0pls2 vif 101 ip ospf cost '11'
set interfaces dataplane dp0pls2 vif 102 address '10.102.4.3/24'
set interfaces dataplane dp0pls2 vif 102 ip ospf cost '12'
set interfaces loopback lo address '3.3.3.3/32'
set protocols ospf area 0 network '10.10.3.0/24'
set protocols ospf area 1 network '10.100.4.0/24'
set protocols ospf area 1 network '10.101.4.0/24'
set protocols ospf area 1 network '10.102.4.0/24'
set protocols ospf area 1 range '10.64.0.0/10'
```

No explicitly configured metric exists for the range, so the ABR advertises the maximum cost to reach all prefixes that match the range. This cost will be at least 12 and possibly more if the ABR learns of a matching prefix from one of its area 1 peers.

```
vyatta@vm-yv-3:~$ show ip ospf database summary self-originate
```

```
OSPF Router with ID (3.3.3.3) (Process ID 0 routing-instance
default)
```

```
Summary Link States (Area 0.0.0.0)
```

```
LS age: 685
```

```
Options: 0x22 (-|-|DC|-|-|-|E|-)
```

```
LS Type: Summary-LSA
```

```
Link State ID: 10.64.0.0 (summary Network Number)
```

```
Advertising Router: 3.3.3.3
```

```

LS Seq Number: 80000001
Checksum: 0x25f4
Length: 28
Network Mask: /10
      TOS: 0  Metric: 12

```

The metric can be set for the range through explicit configuration:

```

set protocols ospf area 1 range 10.64.0.0/10 metric 20
vyatta@vm-yv-3:~$ show ip ospf database summary self-originate

```

```

      OSPF Router with ID (3.3.3.3) (Process ID 0 routing-instance
default)

```

```

      Summary Link States (Area 0.0.0.0)

```

```

LS age: 26
Options: 0x22 (-|-|DC|-|-|-|E|-)
LS Type: Summary-LSA
Link State ID: 10.64.0.0 (summary Network Number)
Advertising Router: 3.3.3.3
LS Seq Number: 80000002
Checksum: 0x739d
Length: 28
Network Mask: /10
      TOS: 0  Metric: 20

```

OSPFv3 Example

An ABR has an interface *dp0p1s1* in area 0 and interfaces *dp0p1s2.100*, *dp0p1s2.101*, and *dp0p1s2.102* in area 1. The ABR summarizes the range 10:100::/30 from area 1 into area 0.

The configuration follows:

```

set interfaces dataplane dp0p1s1 address '10:10:3::3/64'
set interfaces dataplane dp0p1s1 ipv6 ospfv3 area '0'
set interfaces dataplane dp0p1s2 vif 100 address '10:100:4::3/64'
set interfaces dataplane dp0p1s2 vif 100 ipv6 ospfv3 area '1'
set interfaces dataplane dp0p1s2 vif 100 ipv6 ospfv3 cost '10'

```

```

set interfaces dataplane dp0pls2 vif 101 address '10:101:4::3/64'
set interfaces dataplane dp0pls2 vif 101 ipv6 ospfv3 area '1'
set interfaces dataplane dp0pls2 vif 101 ipv6 ospfv3 cost '11'
set interfaces dataplane dp0pls2 vif 102 address '10:102:4::3/64'
set interfaces dataplane dp0pls2 vif 102 ipv6 ospfv3 area '1'
set interfaces dataplane dp0pls2 vif 102 ipv6 ospfv3 cost '12'
set interfaces loopback lo address '3.3.3.3/32'
set protocols ospfv3 area '0'
set protocols ospfv3 area 1 range '10:100::/30'

```

No explicitly configured metric exists for the range, so the ABR advertises the maximum cost to reach all prefixes that match the range. This cost will be at least 12 and possibly more if the ABR learns of a matching prefix from one of its area 1 peers.

```
vyatta@vm-yv-3:~$ show ipv6 ospfv3 database inter-prefix self-originate
```

```

      OSPFv3 Router with ID (3.3.3.3) (Process *null* Routing-instance
default)

```

```

      Inter-Area-Prefix-LSA (Area 0.0.0.0)

```

```

LS age: 305
LS Type: Inter-Area-Prefix-LSA
Link State ID: 0.0.0.3
Advertising Router: 3.3.3.3
LS Seq Number: 0x80000002
Checksum: 0x1ED1
Length: 32
  Metric: 12
  Prefix: 10:100::/30
  Prefix Options: 0

```

The metric can be fixed for the range through an explicit configuration:

```

set protocols ospfv3 area 1 range 10:100::/30 metric 20
vyatta@vm-yv-3:~$ show ipv6 ospfv3 database inter-prefix self-originate

```

```

      OSPFv3 Router with ID (3.3.3.3) (Process *null* Routing-instance
default)

```

Inter-Area-Prefix-LSA (Area 0.0.0.0)

LS age: 31
LS Type: Inter-Area-Prefix-LSA
Link State ID: 0.0.0.3
Advertising Router: 3.3.3.3
LS Seq Number: 0x80000003
Checksum: 0x4C9A
Length: 32
Metric: 20
Prefix: 10:100::/30
Prefix Options: 0

