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BGP SR Policy Extensions for template  
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## Abstract

Segment Routing(SR) Policies can be advertised using BGP. An SR Policy may has lots of attributes, and as the application and features evolve, the SR Policy may need have more and more attribute attributes. To avoid modifying BGP when attributes are added to an SR Policy, we can define a template. The identifier and content of the template are defined by the receiver of the SR Policy. The advertiser of an SR policy only needs to know the ID of the template. When advertising SR policy, the advertiser carries the template ID in the tunnel encapsulation information of the SR policy. After receiving the SR Policy information, the receiver obtains the corresponding template and content according to the template ID, thereby obtaining abundant constraint configuration information.

## Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

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## Table of Contents

1. Introduction . . . . .	2
2. Terminology . . . . .	3
3. Template ID definition . . . . .	3
4. SR Policy and Tunnel Encapsulation Attribute Update . . . . .	4
4.1. Template ID sub-TLV . . . . .	5
5. SR Policy Operations . . . . .	6
5.1. Advertisement of SR Policies . . . . .	6
5.2. Reception of an SR Policy . . . . .	6
6. Acknowledgements . . . . .	7
7. IANA Considerations . . . . .	7
8. Security Considerations . . . . .	7
9. References . . . . .	7
Authors' Addresses . . . . .	8

## 1. Introduction

[I-D.ietf-idr-segment-routing-te-policy] defines some attributes encoding of the SR Policy path. However, in actual applications, there are many other attributes of SR Policy path. These attributes are valid only on the device where the SR Policy path is installed. Such attributes may include backup protection, Bidirectional Forwarding Detection information, traffic statistics collection, or in-situ Flow Information Telemetry detection information, etc. If these attributes are directly delivered through BGP, the BGP SR Policy protocol may change frequently. This document defines a general method to carry the path attributes of SR Policies.

## 2. Terminology

SR Policy: An ordered list of segments.

Candidate Path: the unit for signaling of an SR Policy to a headend via protocol extensions like Path Computation Element (PCE) Communication Protocol (PCEP) [RFC8664]  
[I-D.ietf-pce-segment-routing-policy-cp] or BGP SR Policy  
[I-D.ietf-idr-segment-routing-te-policy].

SRPM: SR Policy Module.

Template: A collection of attributes sets.

Template ID: The identifier of a template.

## 3. Template ID definition

To support the attributes extension of SR Policies, this document defines a constraint template identifier. The constraint template ID is valid only for the recipient. The SR policy publisher only needs to carry the template ID when publishing the SR policy. The receiver of the SR Policy may create a template corresponding to the template identifier in advance before receiving the SR Policy, or may define a corresponding template after receiving the template definition of the SR Policy. The template can contain any attributes on the SR Policy path, including but not limited to backup protection, Bidirectional Forwarding Detection information, traffic statistics collection, or in-situ Flow Information Telemetry detection information, etc. After receiving the SR Policy information, the receiver matches the template information based on the template ID and adds attributes to the SR Policy based on the attributes defined in the template.

Template ID is an local identifier, just to use on the headend of the SR Policy. And it is a local configured identifier, need to be unique only on the headend device. We need no further process to coordinate the template ID between multiple routers.

A template represents a configuration plan intent. In a network managed by a controller, the template can be configured by controller and template ID is specified during the configuration. Therefore, the template ID is planned on the entire network. All policies can use the same template as long as they require the same configuration attributes, regardless of whether they are on the same device.

For example, a policy has two candidate paths with preference 200 and 100. The path with preference 200 has a higher preference and is used as the primary path. The BFD detection time is 10 ms x 3. The

candidate path with preference 100 is used as the backup path, uses BFD detection, and the BFD detection time is 50 ms x 3. Then we can define two templates:

```
Template 1:
  Hotstandby backup Enable
  BFD Seamless Enable
  BFD min-tx-interval 10
  BFD detect-multiplier 3
```

```
Template 2:
  BFD Seamless Enable
  BFD min-tx-interval 50
  BFD detect-multiplier 3
```

```
CP1<E1, C1>:
  <preference = 200,
  SL(Weight=W1): <S1, S2, S3>,
  SL(Weight=W2): <S4, S5, S6>,
  TemplateID = 1>
```

```
CP2<E1, C1>:
  <preference = 100,
  SL(Weight=W1): <S7, S8, S9>,
  SL(Weight=W2): <S10, S11, S12>,
  TemplateID = 2>
```

We can see that the template defines some common attributes and can be used by different SR Policies.

#### 4. SR Policy and Tunnel Encapsulation Attribute Update

As the template ID is defined, the tunnel attribute encapsulation of the BGP SR Policy needs to be updated.

The SR Policy Encoding structure is as follows:

SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>

Attributes:

```

Tunnel Encaps Attribute (23)
  Tunnel Type: SR Policy
    Binding SID
    Preference
    Priority
    Policy Name
    Policy Candidate Path Name
    Explicit NULL Label Policy (ENLP)
    Template ID
    Segment List
      Weight
      Segment
      Segment
      ....
      ....

```

Where Template ID indicates the template ID for the SR Policy candidate path.

#### 4.1. Template ID sub-TLV

A new sub-TLV called Template ID sub-TLV is defined. Template ID sub-TLV specifies the template ID of an SR policy candidate path. Each sub-TLV is encoded as shown in Figure 1.

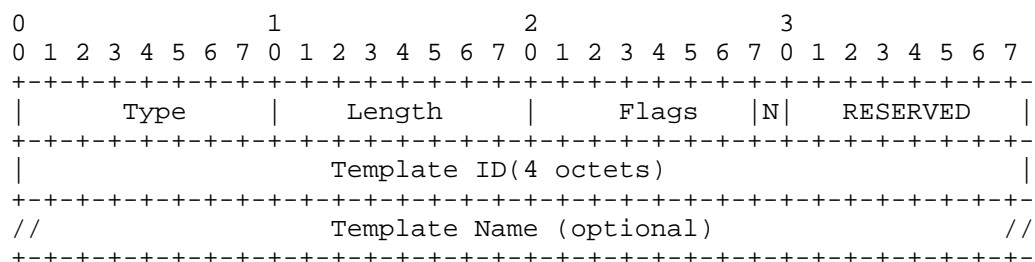


Figure 1: Figure 1: Template ID Sub-TLV

Type: Template ID, 1 octet, TBD.

Length: 6.

Flags: 1 octet of flags.

Where:

N-Flag: This flag, when set, indicates the presence of the Template Name encoding.

RESERVED: 1 octet of reserved bits. SHOULD be set to zero on transmission and MUST be ignored on receipt.

Template ID: a 4-octet value.

Template Name: Template MAY also be assigned with a template name, such template name MUST NOT be considered as identifiers for a template. The size of the template name for the template is limited to 255 bytes.

## 5. SR Policy Operations

### 5.1. Advertisement of SR Policies

When BGP advertises an SR Policy, different candidate paths of the same SR Policy may have different template IDs or the same template ID, depending on the attributes required by the candidate paths of the SR Policy.

Reflectors just need to advertise the route of SR, no need to process it.

### 5.2. Reception of an SR Policy

SR Policy is only to be processed on the SR Policy headend, reflectors just need to reflect the route of SR Policy, no need to process it. To make this possible, an attribute needs to be attached to the advertisement that enables a BGP speaker to determine whether it is intended to be a headend for the advertised policy. This is done by attaching one or more Route Target Extended Communities to the advertisement [RFC4360]. This process is defined in [I-D.ietf-idr-segment-routing-te-policy]. This draft does not add any extra process in this process.

Once BGP on the receiving node has determined that the SR Policy NLRI is usable, it passes the SR Policy candidate path to the SRPM. The SRPM then determine how to use the template ID in SR Policy. The SRPM find the local configured template by template ID, and get all the attributes that is configured in the template, and then process the candidate path with these attributes. For example, if the template configure seamless bfd, then the SRPM can create sbfd sessions for each Segment List in the candidate path. If there is no template find, the SRPM should ignore the template ID and use the candidate path as there is no template ID.

## 6. Acknowledgements

TBD.

## 7. IANA Considerations

This document requests that IANA allocates a new sub-TLV type as defined in Section 4.1 from the "Sub-TLVs for SR Policy" registry as specified.

Value	Description	Reference
TBD	SR Policy Template ID	This document

Figure 2: Figure 2: Template ID sub-TLV

## 8. Security Considerations

These extensions to BGP SR Policy do not add any new security issues to the existing protocol.

## 9. References

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