IS-IS and OSPF extensions for TVR (Time-Variant Routing)

Abstract

TVR needs IGP to calculate different results depending on the time, without convergence after the detection of link or nodes. IGP nodes need to learn the predictable and scheduled changes in advance. This document defines the IGP extensions for predictable and scheduled changes of TVR.

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1. Introduction

This draft is a mirror of [I-D.zw-lsr-tvr-extensions].

[I-D.jietf-tvr-use-cases] and [I-D.jietf-tvr-requirements] describe a new challenge for non-terrestrial networks. In these networks, there are predictable and scheduled changes of link or nodes. The affected nodes which connected the changing link or node advertise the changes after finding the changes. After convergence all the nodes calculate a new routing table. But for the predictable and scheduled changes, the nodes can advertise the changes and do the calculation in advance to reduce the convergence time.

```
+-------------------+   +-------------------+   +-------------------+
| Satellite Network |   | Satellite R1      |   | Satellite R2      |
|                   |   | ----------------- |   |                    |
|                   |   | Satellite R1      |   | Satellite R2      |
|                   |   | ----------------- |   |                    |
|                   |   | Ground Station1   |   | Ground Station2   |
|                   |   | ----------------- |   |                    |
|                   |   | Ground Network    |   |                    |
```

Figure 1
In Figure 1, the ground station 1/2 connects the Satellite. Because of the satellite movement, the metric between satellite and ground station changes over time. Because the movement is periodic, the metric is changed periodically. Regardless the unexpected situation like bad weather, the metric variation is predictable and scheduled. The ground station 1/2 advertises the predictable and scheduled metric variation to the ground network. Then the nodes in the ground network can learn the scheduled metric and calculate the routing table in advance.

This document defines a set of extensions to IS-IS, OSPFv2 and OSPFv3 for predictable and scheduled changes of TVR. These extensions can be advertised by the node self which has predictable and scheduled changes, or by the node which connected or adjacent to the node which has predictable and scheduled changes.

### 1.1. 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 [RFC2119].

### 2. Terminology

TBD.

### 3. Time Variant Algorithm

The predictable and scheduled changes can be looked as a net of new constrains which defined in [RFC9350]. The new constrains are advertised as new sub-tlvs.

### 4. Time Variant sub-TLVs of IS-IS and OSPF FAD Sub-TLV

A new type of Metric-Type is defined for time variant in IS-IS FAD sub-TLV which defined in section 5.1 [RFC9350] and OSPF FAD sub-TLV which defined in section 5.2 [RFC9350].

A new Time Variant sub-TLV is advertised as a sub-TLV of IS-IS FAD sub-TLV and OSPF FAD sub-TLV. The Time Variant sub-TLV has following formats:
5. Handling of the time variant sub-TLV

The handling follows the definition in [RFC9350], except one or more timers are scheduled for different time-slot carried in time variant sub-tlv. When a scheduled time-slot is coming, the associated routing table needs to be calculated with the associated metric.

6. IANA Considerations

The document requests new allocations from the IANA registries as follows:

6.1. IGP Metric-type Registry

IANA is requested to allocate a new code points from the "IGP Metric-Type" registry.
6.2. IS-IS Registry

IANA is requested to allocate a new code points from the "IS-IS Sub-TLVs for Flexible Algorithm Definition Sub-TLV" registry.

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<th>Description</th>
<th>Reference</th>
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<tbody>
<tr>
<td>TBD2</td>
<td>Time Variant</td>
<td>This Document</td>
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Table 2: IS-IS TVR sub-TLV

6.3. OSPF Registry

IANA is requested to allocate a new code points from the "OSPF Flexible Algorithm Definition TLV Sub-TLVs" registry.

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</tbody>
</table>

Table 3: OSPF TVR sub-TLV

7. Security Considerations

This document does not introduce more security consideration than [RFC9350].

8. References

8.1. Normative References


8.2. Informative References

[I-D.ietf-tvr-requirements] King, D., Contreras, L. M., and B. Sipos, "TVR (Time-Variant Routing) Requirements", Work in


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