BGP SR Policy Extensions for Path Scheduling

draft-zzd-idr-sr-policy-scheduling-09

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Updates

- The definition of **epoch is added**, which is 1 January 1970 at 00:00 UTC.
- A description is added for the case when the **Schedule Time Information sub-TLV is carried at both candidate path level and segment list level**.
- A description is added for that the Scheduling Time Information sub-TLV is **currently used in SR policy tunnel TLV**, and may be extend to other tunnel TLVs in the future.
- A description is added for when the **headend does not have the capability** to deal with Schedule Time Information sub-TLV.
- **Error Handling and Fault Management** section is added.
- **Manageability Considerations** section is added.
- **Security Considerations** section is added.
- Some editorial updates.

Motivation

- **Networks with Discontinuous Links**

In some cases, the **links** between the network devices and network controller may very **weak or intermittent**, this is very typical in Resource Preservation and Dynamic Reachability network[RFC9657] where the devices or links only work at specific time points. In these cases, Real-time SR policy advertising (before changes occur) may be **untimely and causing packet loss**.

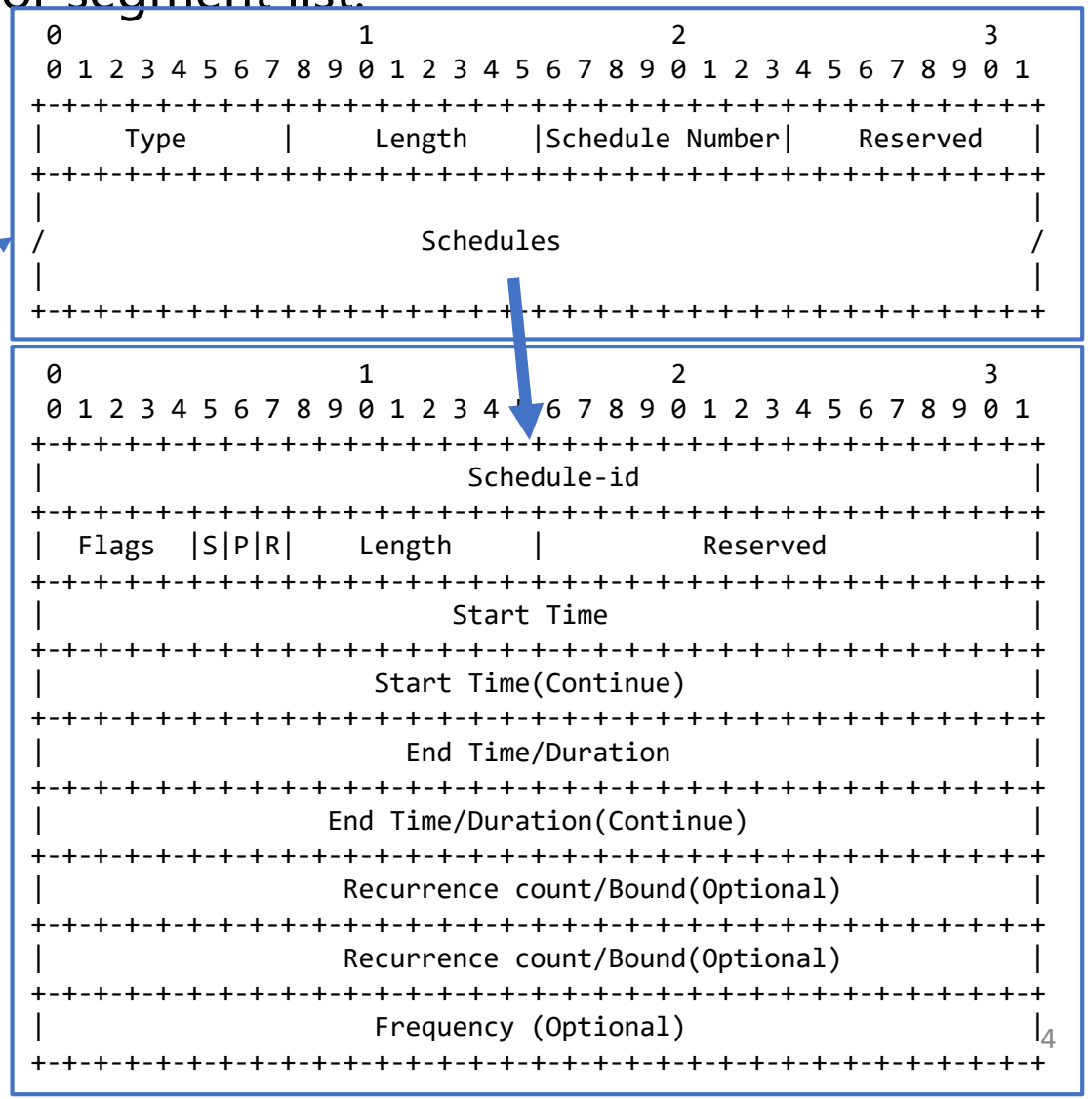
- **Networks with Frequent Topology Change**

There are also some cases that topology changes frequently. This is very typical when the **number of network entities is very large** (For example, a Dynamic Reachability network with hundreds or thousands of nodes). In this kind of network, the **paths change frequently**, which pose great **challenge to the network controller**.

BGP SR Policy Extension

The Schedule Time Information sub-TLV can be applied to a candidate path or a segment list, indicating the valid time for each candidate path or segment list.

SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
- Attributes:
  - Tunnel Encapsulation Attribute (23)
    - Tunnel Type: SR Policy (15)
      - Binding SID
      - SRv6 Binding SID
      - Preference
      - Priority
      - Policy Name
      - Policy Candidate Path Name
      - Explicit NULL Label Policy (ENLP)
      - Schedule Time Information
      - Segment List
        - Schedule Time Information
        - Weight
        - Segment
        - Segment
        - ...
      - ...



Operations

☐ Advertisement of SR Policies with Schedule Time Information:

- SR Policies and associated Schedule Time Information sub-TLV are computed by a controller or a path computation engine (PCE) and originated by a BGP speaker on its behalf.
- Each schedule is identified by a schedule-id, the controller or PCE ensures the schedule-id unique within a specific SR Policy.

☐ Reception of an SR Policy with Schedule Time Information:

- Validation: check the uniqueness of schedule-id, the rationality of time parameters.
- If a SR Policy encapsulates Schedule Time Information sub-TLVs at both candidate path level and segment list level simultaneously, then the sub-TLVs at segment list level is used.
- Enable/disable candidate paths/segment lists:
  - The headend parses the SR Policy and saves the schedule time information locally.
  - The headend dynamically enables/disables different Candidate Paths/Segment Lists based on the schedule time information.

Error Handling and Fault Management

- The error handling actions defined in Section 5 of draft-ietf-idr-sr-policy-safi are also applicable in this document.
- If a BGP speaker receives a SR Policy with Schedule Time Information TLV but it **does not have the capability** to deal with the schedule time information sub-TLV, **then the SR Policy SHOULD NOT be considered usable** as described in Section 4.2.2 of i.
- The validation of Schedule Time Information sub-TLV also SHOULD be performed to determine if the it is malformed or invalid. **If the Schedule Time Information sub-TLV is invalid or malformed**, **then the SR Policy MUST NOT be used and MUST be handled by "treat-as-withdraw"** as specified in Section 5. of draft-ietf-idr-sr-policy-safi.

Q&A

- **Q1: Why not just run schedule on controller and send the new policies to devices when topology changes?**
- A1: As described in the motivation section, in some scenarios, the connections between the headend and controller are not stable, and in some other scenarios, the topology changes very frequent, the controller need to deliver new SR Policies very frequent. In these cases, running schedule on headend is better than on the controller.
- **Q2: What will happen if the receiving headend does not support this capability?**
- A2: MUST NOT use this SR Policy.
- **Q3: What will happen if the connection between the headend and controller is interrupted, will the scheduling route be withdraw?**
- A3: The Graceful Restart(GR) is used to retain the routes received form the controller when the connection is interrupted.
- **Q4: The length of start time and end time is 64 bits, does POSIX has specified a 64-bit time_t?**
- A4: Not yet, but 32-bit time_t will wrap around on 19th Jan 2038. Let' s leave this question for future.

Next steps

WG adoption?

Welcome for comments and suggestions

Thank You