

BGP Extensions for Network Resource Partition

draft-li-idr-bgp-nrp-00

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IETF-125, March 2026

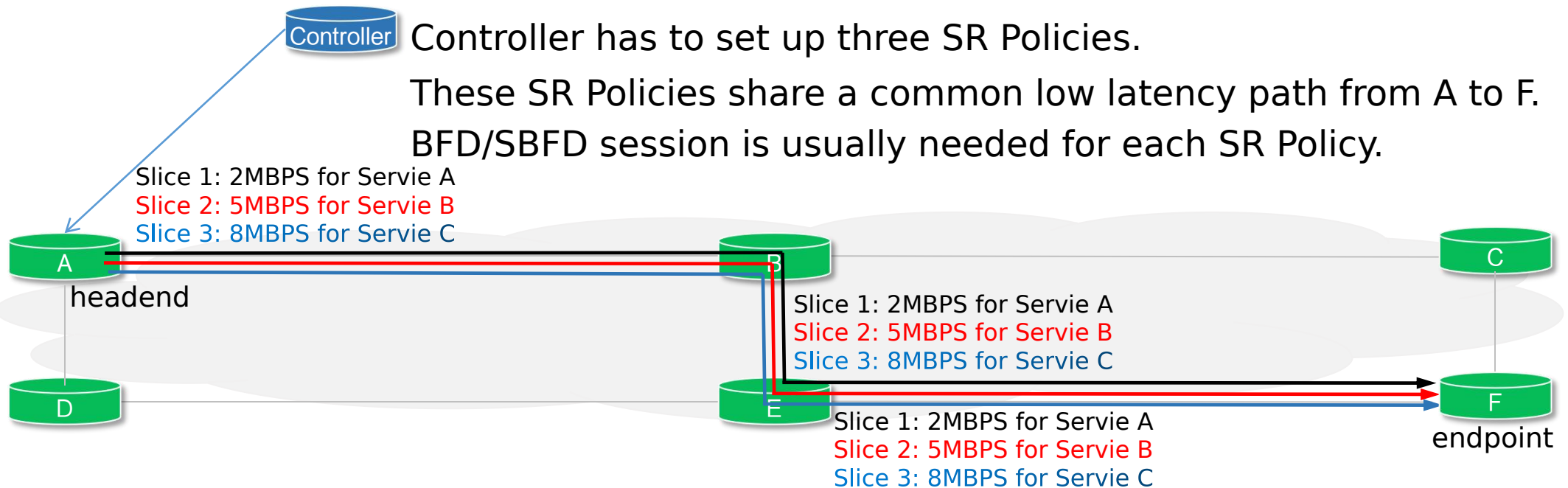
Motivations

- To decouple SR Policy from NRP to increase the scalability of NRPs.
- Existing approaches bind a SR Policy to a NRP on a one-to-one basis.
 - *draft-ietf-idr-sr-policy-nrp extends the BGP SR Policy protocol [RFC9830] to distribute the NRP ID and its associated SR Policy together when the SR Policy is delivered from a SDN controller to the headend node in the network.*

```
SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
Attributes:
  Tunnel Encaps 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)
      NRP
      Segment List
        Weight
        Segment
        Segment
        ...
      ...
```

Motivations

- It is feasible and can be deployed within a limited domain with a small number of NRPs.
- However, it lacks flexibility and incurs significant operational overhead as the number of NRPs scales, especially when multiple NRPs share the same SR Policy path.



Proposed Solution

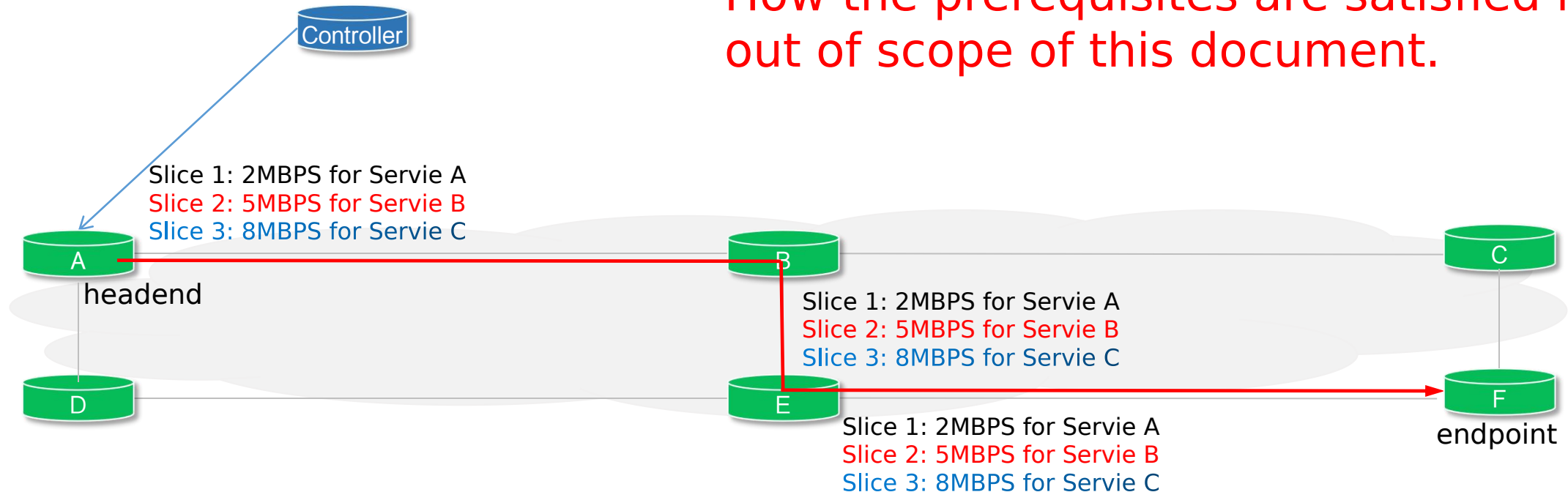
- Extending BGP, rather than BGP SR Policy, to advertise NRP ID information in routing updates between network nodes.
- This solution decouples SR Policy from NRP, while coupling NRP with the services that demand the corresponding NRP for forwarding resources.
 - *Our key idea is that it is the service—not the SR Policy—that requires NRP.*
- Our solution allows multiple NRPs to share a common SR Policy path, thereby avoiding linear growth of SR Policies. This eliminates heavy OPEX burdens related to SR Policies, removes duplicated SR Policies, and avoids the need for associated BFD/SBFD sessions.

Procedures

- **Prerequisites:**

- An appropriate SR Policy has been set up.
- The forwarding resources for NRPs are reserved.
- All nodes support the data plane encapsulation method for NRP.

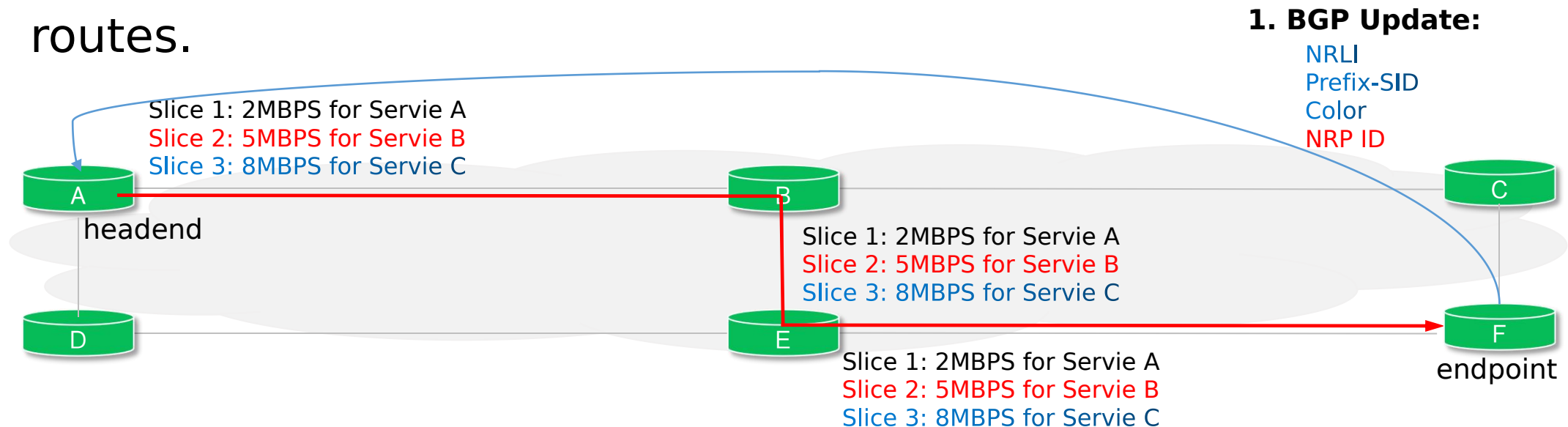
How the prerequisites are satisfied is out of scope of this document.



Procedures

- **BGP Updates:**

- According to service requirements, the endpoint carries the NRP ID information in the NRP ID Extended Communities Attribute when advertising service routes to the headend.
- Upon receiving BGP updates with NRP ID Extended Communities Attribute, the headend associates the NRP ID with the corresponding routes.



Procedures

- **Traffic Forwarding:**

- Headend node: When it receives a packet matching the BGP route corresponding to a SR Policy and a NRP, headend node encapsulates the packet and forwards it to the first segment of the corresponding SR Policy. Then, the packet is forwarded with the network resources corresponding to the NRP ID.

2. Traffic Forwarding:

routing lookup

packet encap

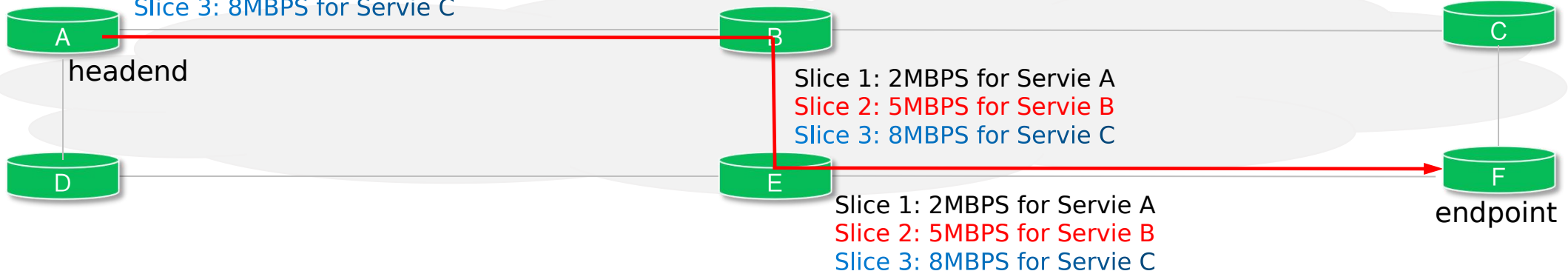
SR Policy forwards

NRP forwards

Slice 1: 2MBPS for Servie A

Slice 2: 5MBPS for Servie B

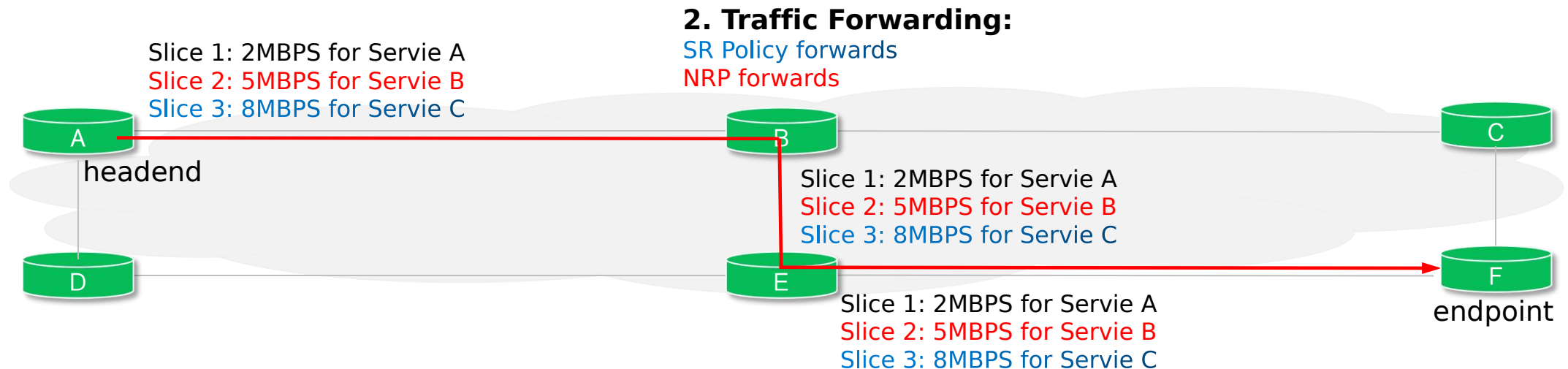
Slice 3: 8MBPS for Servie C



Procedures

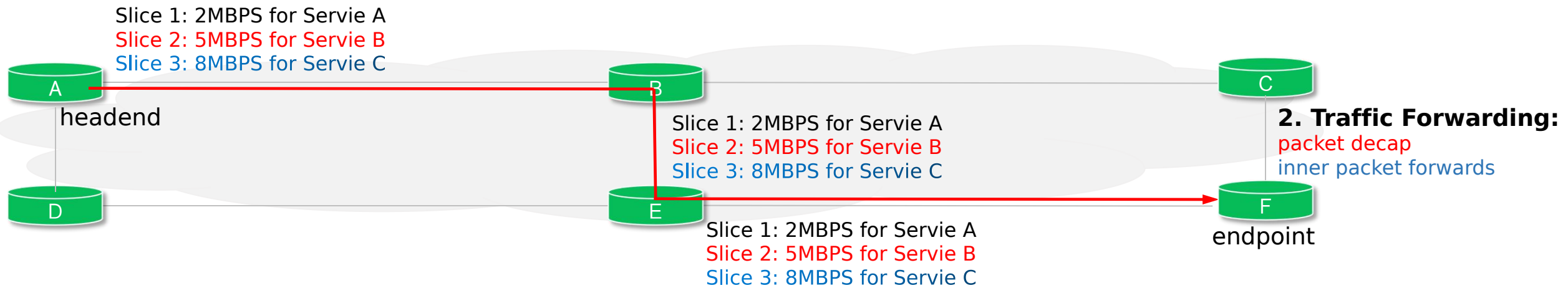
- **Traffic Forwarding:**

- Intermediate Node: forwards the packet along the SR Policy path based on the destination IP address (SID). Then, the packet is forwarded with the network resources corresponding to the NRP ID.



Procedures

- **Traffic Forwarding:**
 - Endpoint Node: decapsulates the packet and forwards the inner packet accordingly.



Next Steps

- Further reviews and comments are greatly appreciated.

Thanks!