

Practice Exam Questions for: Nokia Segment Routing (exam number: 4A0-116)

The following questions will test your knowledge and prepare you for the Nokia Segment Routing exam. Compare your responses with the Answer Key at the end of the document.

1. A router can take different actions based on the MPLS labels carried by an incoming data packet. To which of the actions listed below does the following description correspond: “The router uses the top label to make a forwarding decision and removes the label before forwarding the data”?
 - a. Swap and continue
 - b. Pop and continue
 - c. Pop and next
 - d. Pop
2. A router receives an incoming packet that has the Node-SID of another router at the top of the label stack. How should the packet be forwarded?
 - a. The packet must be transmitted onto the physical interface indicated by the SID.
 - b. The packet must be forwarded to the neighboring router whose Router ID is the same as the SID.
 - c. The packet must be forwarded towards the router that owns the SID and using the shortest IGP path.
 - d. The packet must be forwarded to the neighboring router that last forwarded the SID advertisement.
3. Which of the following statements about Segment Routing is FALSE?
 - a. Segment Routing allows protocol consolidation, as the routing protocol also advertises the segment IDs.
 - b. Segment Routing tunnels with traffic-engineering constraints require a single label to specify the end-to-end path.
 - c. Segment Routing is more scalable than RSVP-TE, as the tunnel status is only maintained at the head-end.
 - d. Segment Routing does not go through a path setup procedure to create the end-to-end tunnels.
4. Which of the following statements about Node-SIDs is TRUE?
 - a. They are associated with a router’s physical interfaces.
 - b. They are taken from the router’s pool of dynamic labels.
 - c. They can be configured directly as an MPLS label or indirectly as an index.
 - d. They are advertised as explicit MPLS label values.

5. Which of the following statements about the advertisement of Segment Routing information in IS-IS is TRUE?
 - a. Adjacency-SIDs are advertised inside the Prefix-SID TLV.
 - b. Adjacency-SIDs can be advertised across areas by configuring and applying leaking policies.
 - c. Node-SIDs are advertised inside the Router Capability TLV.
 - d. Node-SIDs are advertised across areas.
6. Which of the following statements about the scope of Segment Routing messages in OSPF is FALSE?
 - a. OSPF uses area-local Opaque LSAs to advertise Segment Routing information.
 - b. Adjacency-SIDs are advertised across all areas.
 - c. Node-SIDs from one area are learned in other areas as well.
 - d. A router's local Segment Routing Global Block (SRGB) is only known by other routers in the same area.
7. If the IS-IS routing protocol is already operational on a router, which of the following steps is NOT required to enable IS-IS to support Segment Routing?
 - a. Explicitly enabling Segment Routing under the IS-IS context.
 - b. Configuring the local Segment Routing Global Block (SRGB) under the IS-IS context.
 - c. Enabling the MPLS context and adding to it the same interfaces on which IS-IS has been enabled.
 - d. Configuring a Node-SID associated with a router's logical interface (system or loopback).
8. If the OSPF routing protocol is already operational on a router, which of the following steps is NOT required to enable OSPF to support Segment Routing?
 - a. Configuring the MPLS label range that will be reserved for Segment Routing under the [/configure router mpls-labels] context.
 - b. Explicitly enabling Segment Routing under the OSPF context.
 - c. Configuring an Adjacency-SID associated with each of the physical interfaces on which OSPF has been enabled.
 - d. Selecting the flooding scope of Segment Routing information.

9. According to the exhibit and considering that the IS-IS routing protocol has been enabled on router R01 to support Segment Routing, which of the following tunnels is ready to be used by a VPN service that has been configured on router R01 to use sr-is-is transport tunnels?

```
(ex) [/configure router "Base" isis 0]
A:admin@R01# /tools dump router segment-routing tunnel
```

Legend: (B) - Backup Next-hop for Fast Re-Route (D) - Duplicate label stack is ordered from top-most to bottom-most					
Prefix Sid-Type	Fwd-Type Next Hop(s)	In-Label	Prot-Inst(algoId)	Out-Label(s)	Interface/Tunnel-ID
10.10.10.1 Node	Terminating	100001	ISIS-0		
10.10.10.2 Node	Orig/Transit 10.1.2.2	100002	ISIS-0	100002	toR2
10.10.10.3 Node	Orig/Transit 10.1.3.3	100003	ISIS-0	100003	toR3
10.1.3.3 Adjacency	Transit 10.1.3.3	524284	ISIS-0	3	toR3
10.1.2.2 Adjacency	Transit 10.1.2.2	524287	ISIS-0	3	toR2
No. of Entries: 5					

- a. The one associated with IP address 10.10.10.1
b. The one associated with IP address 10.10.10.2
c. The one associated with IP address 10.1.3.3
d. The one associated with IP address 10.1.2.2
10. Which of the following is one of the main goals of traffic engineering?
- a. Using redundant links that would otherwise be underutilized or not utilized at all.
b. Enforcing limits on the amount of network resources that each traffic stream can utilize.
c. Forwarding traffic using the shortest possible path through the network to the destination.
d. Preventing congestion by randomly dropping packets as soon as the resource usage exceeds a predefined threshold.
11. Which of the following statements about traffic engineering (TE) for Segment Routing is TRUE?
- a. The TE metric associated with a link is zero by default.
b. When evaluating if a path satisfies the hop-limit TE constraint, the hop count includes the head-end router.
c. When a link is associated with an admin-group, it cannot be associated with a shared-risk link group and vice versa.
d. The bandwidth availability link attribute can be configured for an interface as a value higher than its physical bandwidth.
12. Which of the following statements about the steps required to enable traffic engineering for Segment Routing is TRUE?
- a. If RSVP is disabled on an interface, SR-TE LSPs cannot use such an interface.
b. If MPLS is disabled on an interface, its TE link attributes will not be advertised by the routing protocol.
c. If an interface does not have a TE-metric value configured, it cannot be used by SR-TE LSPs calculated using the TE-metric.
d. Oversubscription is possible when the bandwidth availability parameter for an interface is configured with a value greater than 100%.

13. Consider the configuration shown in the exhibit, in which multiple admin groups are assigned to the same interface. What is the value of the admin group membership of interface "toR2"?

```
(ex) [/configure routing-options if-attribute]
A:admin@R01# info
  admin-group "GREEN" {
    value 1
  }
  admin-group "ORANGE" {
    value 2
  }
  admin-group "RED" {
    value 3
  }
```

```
(ex) [/configure router mpls]
A:admin@R01# info
  admin-state enable
  interface "toR2" {
    admin-group ["GREEN" "ORANGE" "RED"]
  }
```

- a. 3
 - b. 6
 - c. 14
 - d. 123
14. Which of the following statements about the application-specific approach to advertising traffic engineering (TE) information is FALSE?
- a. It uses different fields (TLVs) in the routing protocol messages from the ones used by the legacy approach.
 - b. It indicates whether the advertised TE link attributes are relevant to RSVP-TE or SR-TE.
 - c. It is automatically enabled on a router running both RSVP-TE and SR-TE.
 - d. It is supported by both the IS-IS and the OSPF routing protocols.

15. The exhibit shows the effect that the traffic-engineering-options parameters “application-link-attributes” and “legacy” have on IS-IS in terms of how it will advertise traffic engineering (TE) information. What is the default behavior of IS-IS when the parameter “application-link-attributes” remains unconfigured?

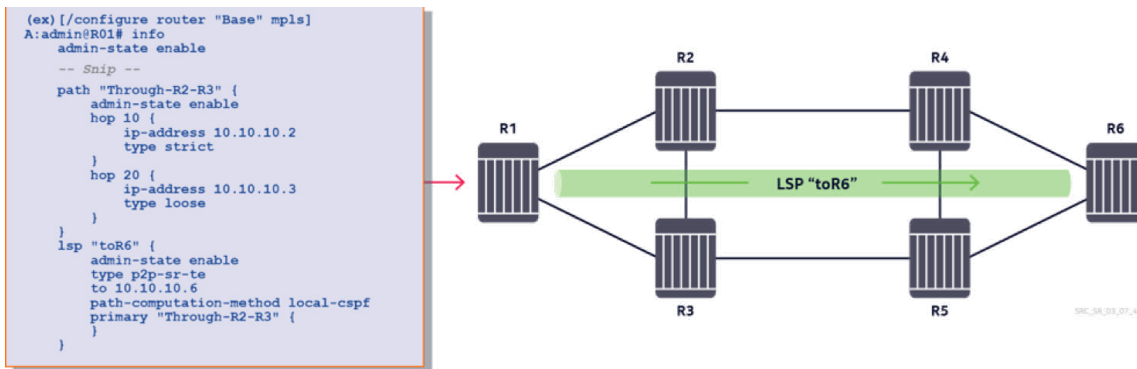
IS-IS Parameters		Interfaces with MPLS and RSVP Enabled	Interfaces with MPLS Enabled and RSVP Disabled
application-link-attributes	legacy		
Unconfigured	N/A	?	?
Configured	false	Advertised with application-specific sub-TLVs	Advertised with application-specific sub-TLVs
Configured	true	Advertised with legacy sub-TLVs	Advertised with legacy sub-TLVs

- Interfaces with MPLS enabled are advertised using legacy sub-TLVs, regardless of whether RSVP is enabled or not.
 - Interfaces with MPLS and RSVP enabled are advertised using legacy sub-TLVs, but interfaces with MPLS enabled and RSVP disabled are not advertised.
 - Interfaces with MPLS and RSVP enabled are not advertised, but interfaces with MPLS enabled and RSVP disabled are advertised using legacy sub-TLVs.
 - Interfaces with MPLS and RSVP enabled are advertised using legacy sub-TLVs, and interfaces with MPLS enabled and RSVP disabled are advertised using application-specific sub-TLVs.
16. The exhibit shows the effect that the traffic engineering options parameter “sr-te” has on OSPF in terms of how it will advertise traffic engineering (TE) information. What is the behavior of OSPF when the parameter “sr-te” is configured as false?

OSPF Parameter: sr-te	Interfaces with MPLS and RSVP Enabled	Interfaces with MPLS Enabled and RSVP Disabled
false	?	?
application-specific-link-attributes	Advertised with application-specific sub-TLVs	Advertised with application-specific sub-TLVs
legacy	Advertised with legacy sub-TLVs	Advertised with legacy sub-TLVs

- Interfaces with MPLS enabled are advertised using legacy sub-TLVs, regardless of whether RSVP is enabled or not.
- Interfaces with MPLS and RSVP enabled are advertised using legacy sub-TLVs, but interfaces with MPLS enabled and RSVP disabled are not advertised.
- Interfaces with MPLS and RSVP enabled are not advertised, but interfaces with MPLS enabled and RSVP disabled are advertised using legacy sub-TLVs.
- Interfaces with MPLS and RSVP enabled are advertised using legacy sub-TLVs, and interfaces with MPLS enabled and RSVP disabled are advertised using application-specific sub-TLVs.

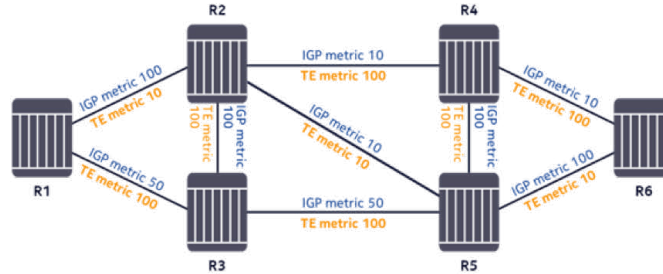
17. An SR-TE LSP configured on router R1, as shown in the exhibit, does not become operational. Which of the following is the likely cause of the issue?
- The LSP is missing a secondary path.
 - The wrong LSP type has been configured.
 - A combination of strict and loose hops is not allowed in the same path definition.
 - The hop-to-label translation method must be used for the path computation of SR-TE LSPs with explicit-hop constraints.
 - The routing protocol has not been enabled to exchange admin-group, SRLG, TE-metric and available-bandwidth information.



18. Which of the following statements about a path definition is FALSE?
- A path definition is an ordered list of explicit hops that must be part of an LSP path.
 - A strict hop is one that must be adjacent to the hop previously added to the list.
 - A loose hop is one that must not be adjacent to the hop previously added to the list.
 - A combination of strict and loose hops is allowed in a single path definition.
 - The LSP tail-end is implicitly added as a loose hop at the end of the list.
19. Which of the following statements about the path computation methods available for SR-TE is FALSE?
- The local hop-to-label translation method ignores admin-group TE constraints.
 - The local hop-to-label translation method ignores SRLG TE constraints.
 - The local CSPF method ignores bandwidth-availability TE constraints.
 - The centralized PCE method ignores hop-limit TE constraints.
 - The centralized PCE method ignores explicit-hop TE constraints.

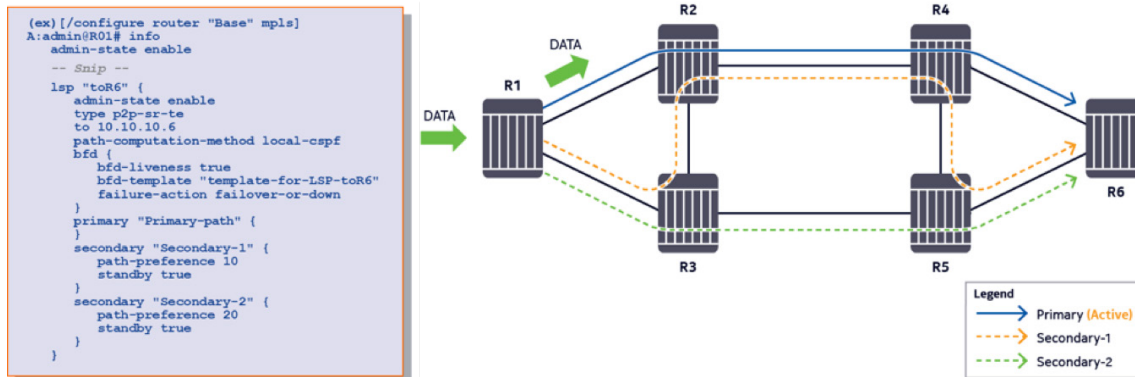
20. The exhibit shows that an SR-TE LSP has been configured on router R1 going to router R6. Router R5 must be included in the path. Considering that the label stack reduction technique has been enabled, what is the calculated LSP path?

```
(ex) [/configure router "Base" mpls]
A:admin@R01# info
admin-state enable
-- Snip --
path "Through-R5" {
  admin-state enable
  hop 10 {
    ip-address 10.10.10.5
    type loose
  }
}
lsp "toR6" {
  admin-state enable
  type p2p-sr-te
  to 10.10.10.6
  path-computation-method local-cspf
  metric-type te
  label-stack-reduction true
  primary "Through-R5" {
  }
}
```

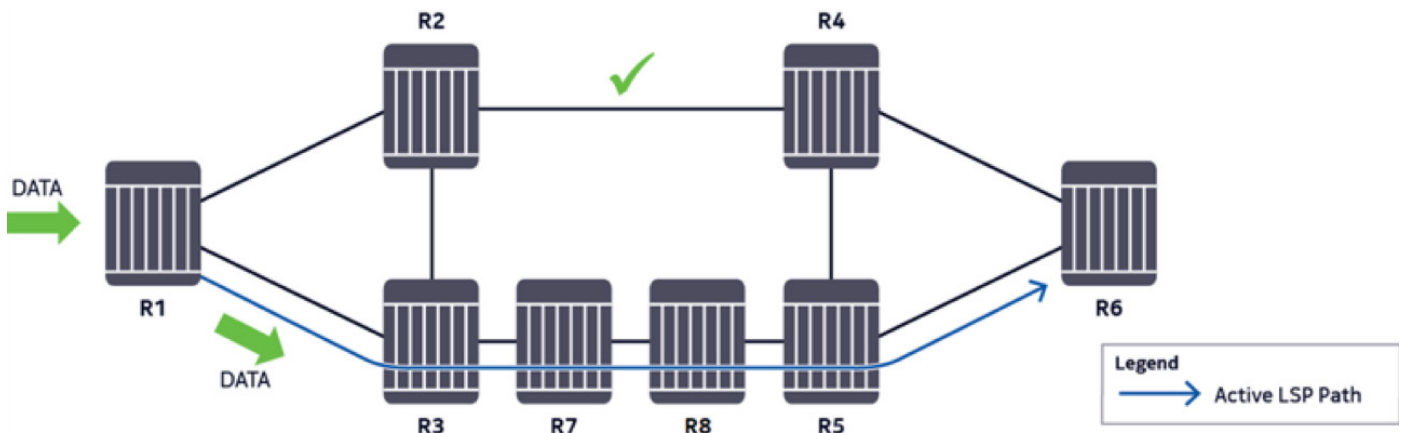


- Node-SID of R6
 - Node-SID of R5 – Node-SID of R6
 - Node-SID of R2 – Node-SID of R5 – Node-SID of R6
 - Node-SID of R2 – Node-SID of R5 – Adjacency-SID to R6
21. Which of the following configuration steps is NOT needed for an LSP to properly switch traffic over to a secondary path in case of a primary path failure?
- Configuring the LSP tail-end as a reflector and assigning a discriminator value to it, so that it can respond to Seamless-BFD messages.
 - Enabling Seamless-BFD at the routing protocol level, so that it advertises which routers are capable to establish Seamless-BFD sessions.
 - Creating a BFD template on the LSP head-end, which will determine how often messages are transmitted and when to declare that a failure has occurred.
 - Configuring how the LSP will react to a notification from Seamless-BFD that the active path has failed.
 - Enabling Seamless-BFD at the LSP level or at the primary path level and assigning the proper BFD template.

22. The exhibit shows that an SR-TE LSP has been configured on router R1 going to router R6. The LSP has one primary path and two secondary paths. Which of the secondary paths will become active when the primary path fails?



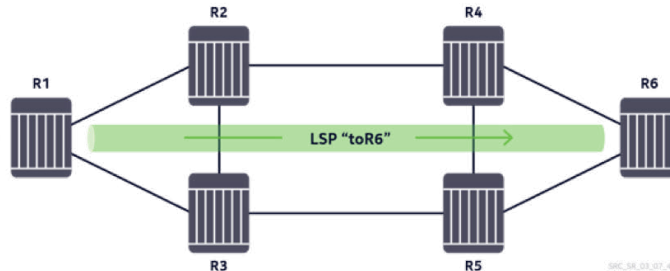
- a. The one with the shortest path
 b. The one with the longest uptime
 c. The one for which the Seamless-BFD session is established first after the failure
 d. Secondary-1
 e. Secondary-2
23. An SR-TE LSP with Seamless BFD enabled and an empty path definition follows the sub-optimal path shown in the exhibit. The path was originally calculated using the hop-to-label translation method. The shorter path through routers R2 and R4 becomes available. What happens next if all the routers in the network follow the default behavior?



- a. The traffic will continue to follow the current path indefinitely.
 b. The head end will find the better path after the retry timer expires and the traffic will be switched over.
 c. The head end will find the better path after the resignal-on-igp-event behavior is triggered and the traffic will be switched over.
 d. The head end will not recalculate the LSP path, but it will still start forwarding traffic to R2 after the IGP reconverges.

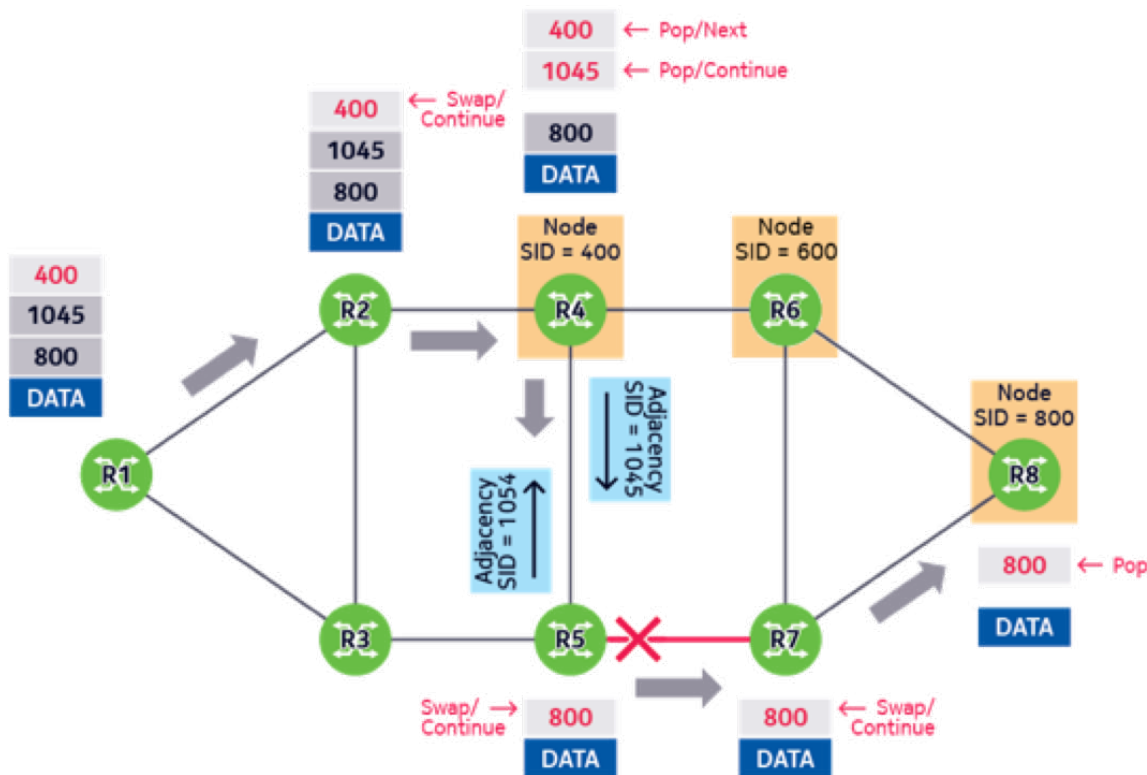
24. Which of the following statements about a Path Computation Element (PCE) is FALSE?
 - a. It calculates traffic-engineering-constrained LSP paths on behalf of PE routers.
 - b. It gathers topology and traffic-engineering information from the network it is serving.
 - c. It uses the BGP protocol to receive and respond to path computation requests from the PE routers.
 - d. It can operate in stateless or in stateful mode.
25. Which of the following protocols is NOT an option for a Path Computation Element (PCE) to gather topology and traffic-engineering information from the network it serves?
 - a. IS-IS
 - b. OSPF
 - c. BGP-LS
 - d. PCEP
26. Which of the following statements about a stateless Path Computation Element (PCE) is FALSE?
 - a. It calculates traffic-engineering-constrained LSP paths on behalf of PE routers.
 - b. It gathers topology information from the network it serves.
 - c. It maintains information related to previously calculated LSP paths.
 - d. It uses the Path Computation Element Protocol to receive and respond to requests from the PE routers.
27. Which of the following is an advantage of using a Path Computation Element (PCE) for the calculation of TE-constrained LSP paths, as compared to using CSPF locally on the PE router?
 - a. The routers in the network do not need to run a traffic-engineering-capable routing protocol.
 - b. The PCE supports a longer list of explicit hops in a path definition.
 - c. The PCE can calculate cross-area traffic-engineering-constrained LSP paths.
 - d. The PCE calculates paths that consist of fewer SIDs, thus reducing the label stack size of data packets.
28. According to the exhibit, which of the following statements about LSP "toR6" is FALSE?

```
(ex) [/configure router "Base" mpls]
A:admin@R01# info
admin-state enable
-- Snip --
lsp "toR6" {
  admin-state enable
  type p2p-sr-te
  to 10.10.10.6
  hop-limit 5
  pce-control false
  pce-report true
  path-computation-method pce
  metric-type te
  primary "prim-path-def" {
    bandwidth 5
    exclude-admin-group {
      group ["GREEN"]
    }
  }
  secondary "sec-path-def" {
    srlg true
    standby true
  }
}
```



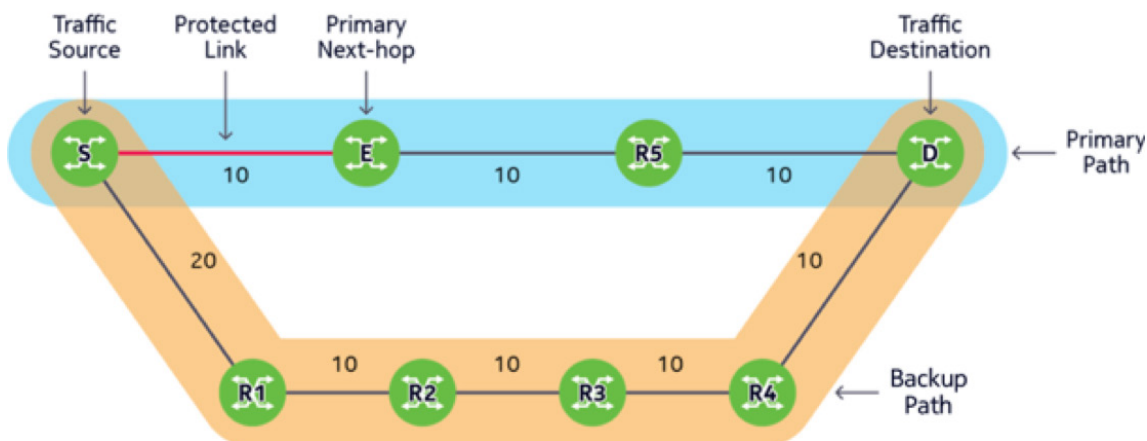
- a. It is a PCC-initiated LSP.
- b. It is a PCE-computed LSP.
- c. It is a PCC-controlled LSP.
- d. It is an LSP reported to the PCE.
- e. It is an LSP that needs to satisfy extended TE constraints.

29. Which of the following statements about fast re-route is FALSE?
- In standard LFA, a backup next-hop for a given destination is a neighbor that will forward a packet addressed to the destination without sending it back to the source.
 - Backup next-hops can be calculated to provide protection against link or node failure.
 - Fast re-route consists of a router locally repairing a failure by quickly switching traffic to the backup next-hop when the primary next-hop becomes unavailable.
 - When fast re-route is triggered, the backup next-hop automatically becomes the new primary next-hop for the IGP paths.
30. As shown in the exhibit, packets are being transmitted inside the multi-segment LSP going from router R1 to router R8. As one of those packets reaches router R5, the link between routers R5 and R7 fails and fast re-route (FRR) is triggered. Considering that all the links have the same IGP cost, what will router R5 do?



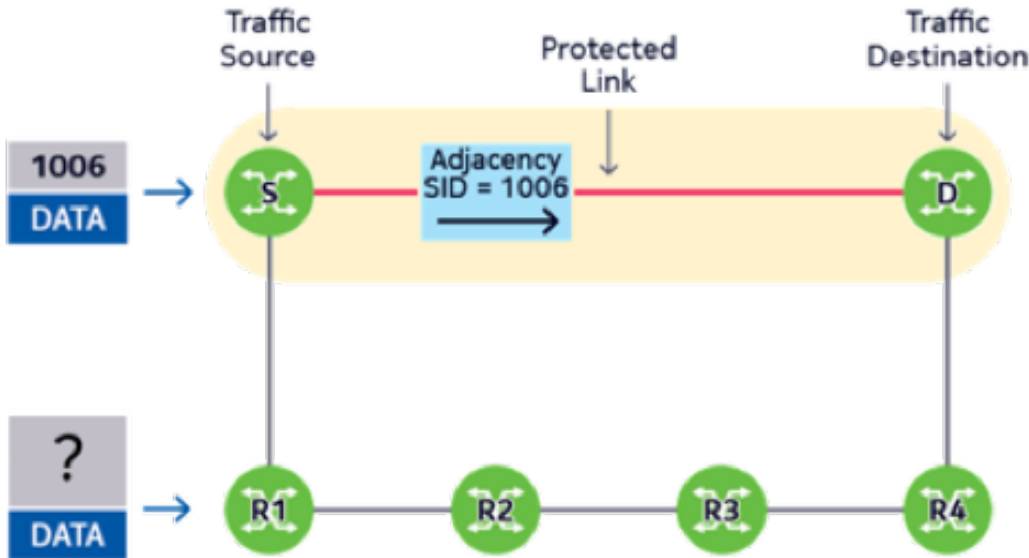
- It will drop the packet to avoid creating a forwarding loop.
- It will forward the packet to router R4 without modifying the label stack.
- It will push Adjacency-SID 1054 to the packet before forwarding it to router R4.
- It will push Node-SID 400 to the packet before forwarding it to router R4.
- It will push Node-SIDs 600 and 400 to the packet before forwarding it to router R4.

31. Considering that Segment Routing is already enabled for the IS-IS routing protocol, which of the following commands is mandatory on a Nokia 7750 SR to enable fast re-route for Segment Routing in such a way that it can only use standard LFA paths?
 - a. `/configure router isis loopfree-alternate`
 - b. `/configure router isis loopfree-alternate remote-lfa node-protect`
 - c. `/configure router isis loopfree-alternate ti-lfa max-sr-frr-labels 3`
 - d. `/configure routing-options ip-fast-reroute true`
32. For any of the LFA methods to work properly, the traffic source must be able to find a router in the backup path that will forward packets addressed to the destination without sending them back to the source. Which of the following statements describes the way standard LFA selects such a router?



- a. It selects an immediate neighbor.
- b. It selects a P-Q node.
- c. It selects a Q node.
- d. It can select an immediate neighbor, a P-Q node, or a Q node, as long as the backup path coincides with the path that will become active after IGP reconvergence.

33. The exhibit highlights in yellow the primary path of a segment going from router S to router D. The exhibit also shows a backup path. The protected link fails and fast re-route is triggered on router S. If the backup path has been calculated using R-LFA, how many SIDs are included in the label stack of the data packet forwarded to router R1?



- 1
 - 2
 - 3
 - 4
34. The exhibit shows the fast re-route configuration on router R1, in which R-LFA has been enabled but not TI-LFA. Assume that there are multiple potential backup paths for a given destination. Which of the following options will router R1 use?

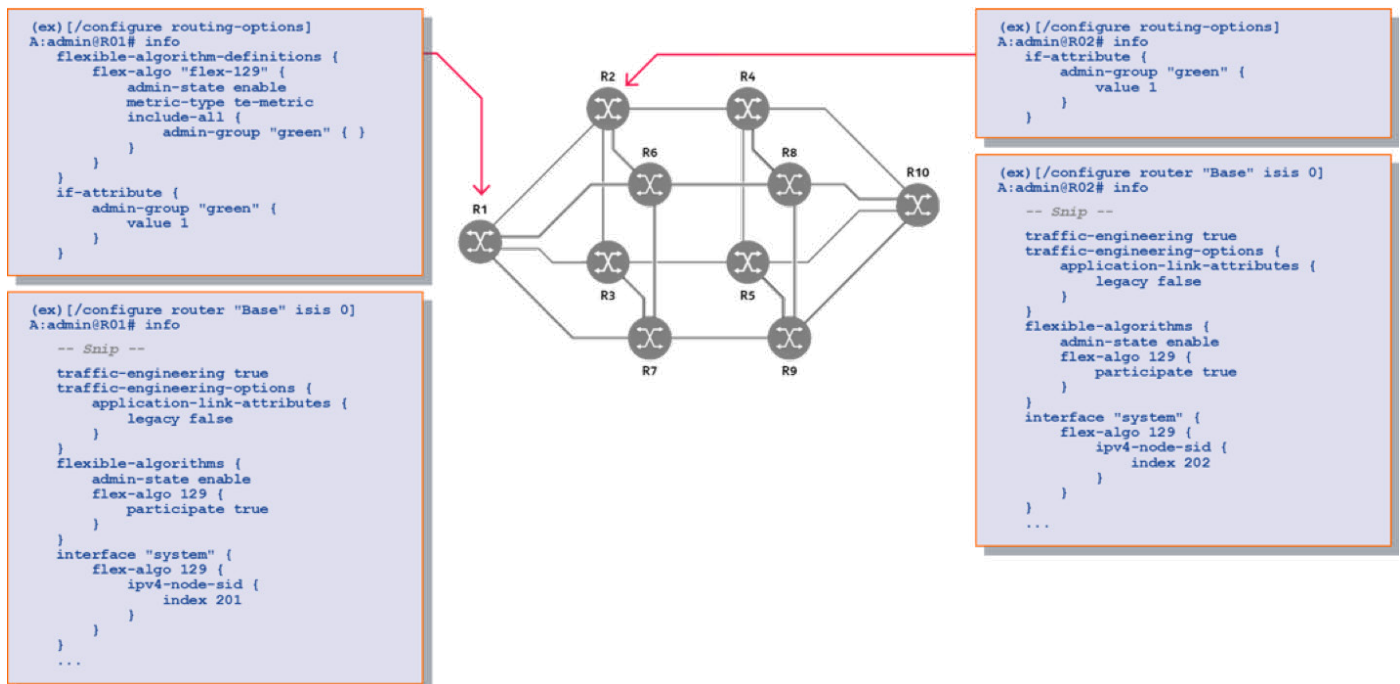
```
(ex) [/configure router "Base" isis 0]
A:admin@R01# info

-- Snip --

loopfree-alternate {
  remote-lfa {
  }
}
```

- An R-LFA path that would not coincide with the path after IGP reconvergence.
- A D-LFA path that would not coincide with the path after IGP reconvergence.
- A standard LFA path that would coincide with the path after IGP reconvergence.
- An R-LFA path that would coincide with the path after IGP reconvergence.

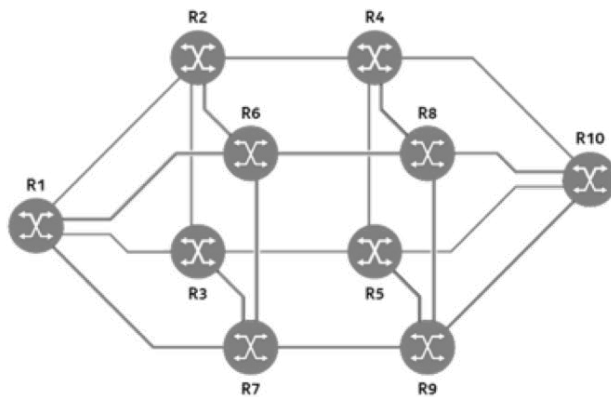
35. Which of the following statements is NOT a characteristic of a flex-algo instance?
- Admin-group constraints apply to the flex-algo instance and, consequently, to every LSP that belongs to it.
 - The shortest-path calculation, hence the selection of the optimum next-hop, only considers links that are members of the flex-algo instance topology.
 - The shortest-path calculation can be based on one of the following link-metric types: IGP cost, traffic-engineering cost or link delay.
 - Typically, the definition of the end-to-end path is achieved by a combination of Node-SIDs and Adjacency-SIDs.
36. As shown in the exhibit, routers R1 and R2 have been configured to create a flex-algo instance. However, no flex-algo tunnels are created on either router. What is missing?



- Routers R1 and R2 must have consistent flex-algo definitions.
 - Routers R1 and R2 must have consistent definitions of the relevant admin groups.
 - At least one of the routers must advertise the flex-algo definition.
 - Routers R1 and R2 must enable their routing protocol to advertise application-specific traffic-engineering information.
 - Both routers R1 and R2 must advertise their willingness to participate in the flex-algo instance.
 - Each of routers R1 and R2 must be assigned an additional Node-SID, specific to the flex-algo instance.
37. Multiple flex-algo definitions are advertised with inconsistent parameters. Which of the following statements is TRUE?
- If they are advertised with different flex-algo IDs, all the advertisements are rejected.
 - If they are advertised with different flex-algo IDs, only the one advertised with the highest priority value is accepted.
 - If they are advertised with the same flex-algo ID, all the advertisements are accepted.
 - If they are advertised with the same flex-algo ID, only the one advertised with the highest priority value is accepted.

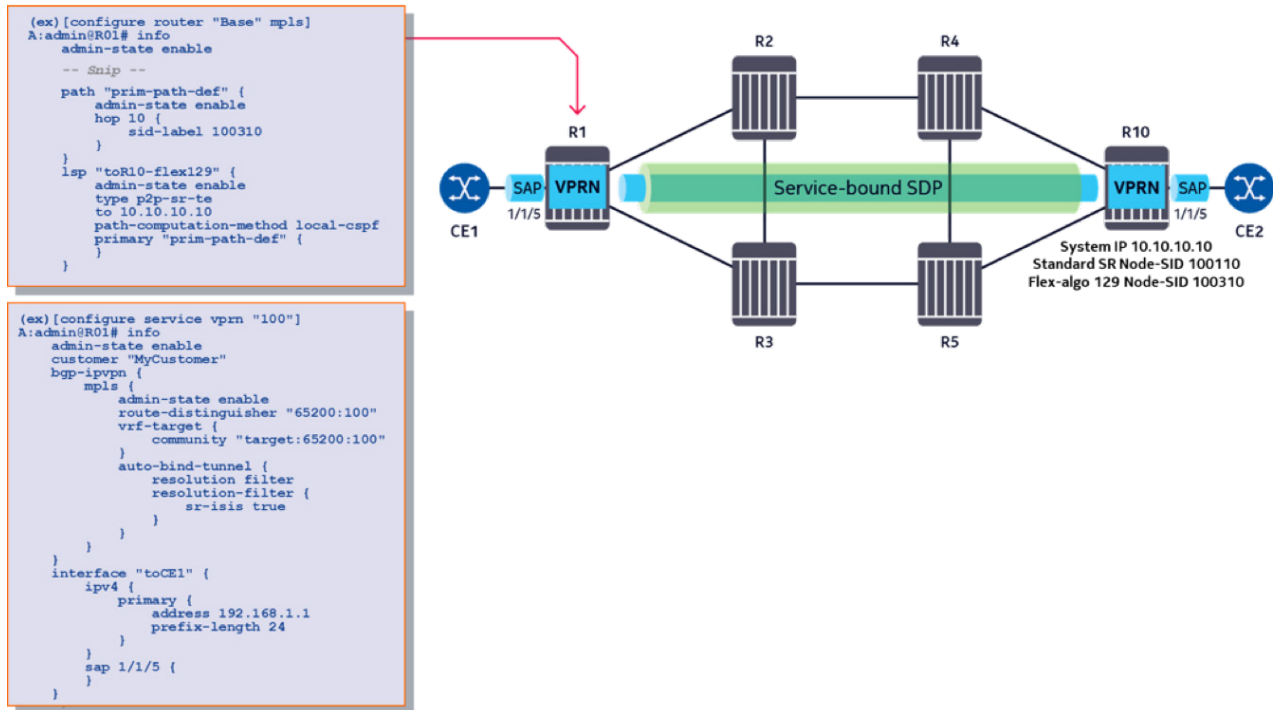
38. Which of the following statements regarding the way IS-IS advertises flex-algo information is FALSE?
- The flex-algo definitions are advertised inside the Router Capability TLV.
 - The flex-algo link attributes for an interface are advertised inside the Extended IS Reachability TLV associated with that interface.
 - The flex-algo link attributes are advertised with an "S" SABM flag, indicating that they are relevant for the Segment Routing application.
 - The flex-algo Node-SIDs are advertised inside the Extended IP Reachability TLV.
39. The exhibit shows the IS-IS configuration on router R1. Considering that segment routing has been properly enabled for the IS-IS routing protocol, which of the following statements is FALSE?

```
(ex)[/configure router "Base" isis 0]
A:admin@R01# info
-- Snip --
traffic-engineering true
traffic-engineering-options {
  application-link-attributes {
    legacy false
  }
}
loopfree-alternate {
  remote-lfa {
  }
  ti-lfa {
  }
}
flexible-algorithms {
  admin-state enable
  flex-algo 129 {
    loopfree-alternate { }
    participate true
    advertise "Real-time-traffic"
  }
}
...
```



- Remote-LFA and TI-LFA are both enabled for the standard segment routing instance.
- Fast re-route is enabled for flex-algo instance 129.
- Remote-LFA and TI-LFA are both enabled for flex-algo instance 129.
- Router R1 advertises the LFA options it supports for flex-algo instance 129 to other routers that participate in the same instance.

40. In the exhibit, segment routing has been properly enabled for the IS-IS routing protocol and all routers participate in flex-algo instance 129. Which configuration command needs to be modified on router R1 for VPRN “100” to reach router R10 using a transport tunnel that belongs to flex-algo 129?



- Hop 10 in the path definition “prim-path-def” needs to be identified by sid-label 100110.
- Hop 10 in the path definition “prim-path-def” needs to be identified by IP address 10.10.10.10.
- The auto-bind-tunnel resolution-filter list in VPRN “100” needs to include sr-te instead.
- An export policy that tags VPN routes with flex-algo instance 129 must be applied to VPRN “100”.



Answer Key

1. B	10. A	19. D	28. E	37. D
2. C	11. B	20. D	29. D	38. C
3. B	12. B	21. B	30. B	39. D
4. C	13. C	22. D	31. A	40. C
5. D	14. C	23. D	32. A	
6. B	15. B	24. C	33. B	
7. C	16. B	25. D	34. C	
8. C	17. E	26. C	35. D	
9. B	18. C	27. C	36. C	

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