

Scoping of TE link attributes in ISIS using TE attribute sets and SRLG sets

draft-bowers-isis-te-attribute-set

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draft-bowers-isis-te-attribute-set

- There may be some use cases for advertising different values for the same link attribute in such a way that different applications can use those different values of the same link attribute.
- At this point, the most concrete use case involves allowing different applications to use different sets of SRLGs.
- draft-ginsberg-isis-te-app addresses the same problem space.
- draft-bowers-isis-te-attribute-set addresses some issues we see in the encoding proposed by draft-ginsberg-isis-te-app

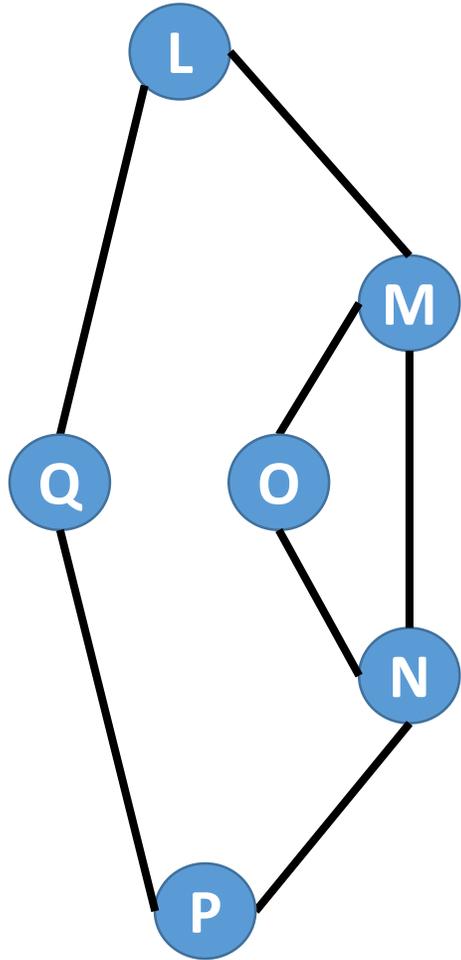
TE attribute sets

- Attributes advertised using the existing sub-TLVs of TLV#22 are all associated with the default attribute set (TE attribute set ID = 0).
- New Link Attribute Set sub-TLV in TLV#22 is used to associate a non-zero TE attribute set ID with the link attributes in the new Link Attribute sub-sub-TLVs.
- Each advertised attribute is therefore associated with a TE attribute set ID.

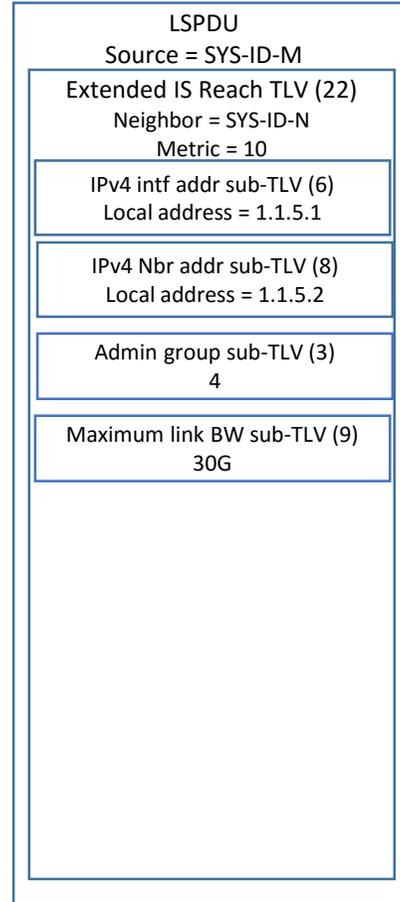
Type	Description
3	Administrative group (color)
9	Maximum link bandwidth
10	Maximum reservable link bandwidth
11	Unreserved bandwidth
14	Extended Administrative Group
18	TE Default metric
33	Unidirectional Link Delay
34	Min/Max Unidirectional Link Delay
35	Unidirectional Delay Variation
36	Unidirectional Link Loss
37	Unidirectional Residual Bandwidth
38	Unidirectional Available Bandwidth
39	Unidirectional Utilized Bandwidth

TE link attributes sub-TLVs given the ability to be advertised with different values scoped by TE attribute set identifier

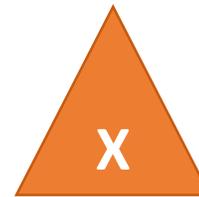
TE attribute set usage (1)



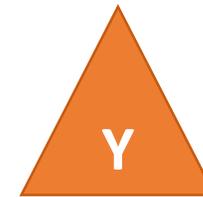
Advertisement
from M



admin group = 4 and
maximum link BW= 30G
are implicitly advertised with TE attribute set ID = 0
(the default TE attribute set).



admin group = 4
maximum link BW= 30G



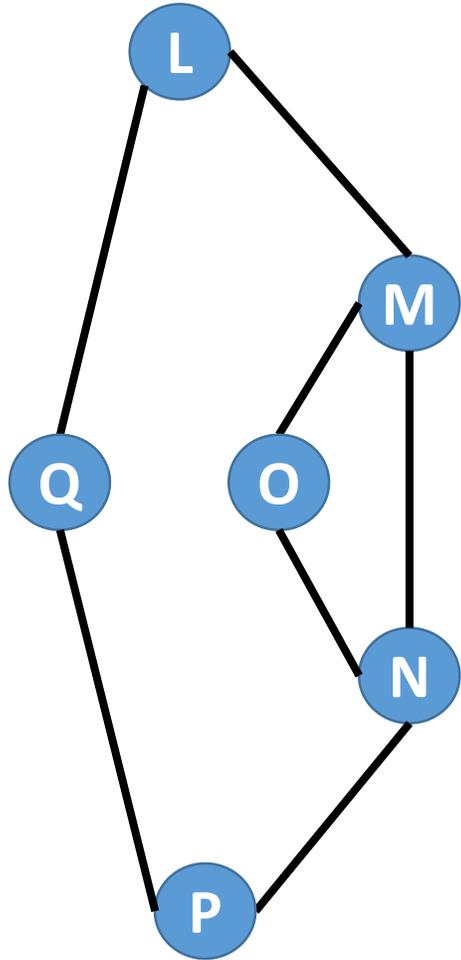
admin group = 4
maximum link BW= 30G



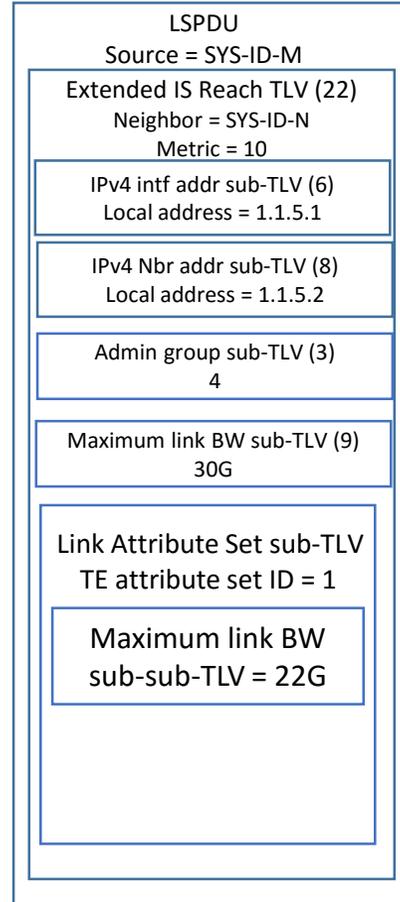
admin group = 4
maximum link BW=30G

Applications X, Y, and Z all use the attributes in the default TE attribute set.

TE attribute set usage (2)

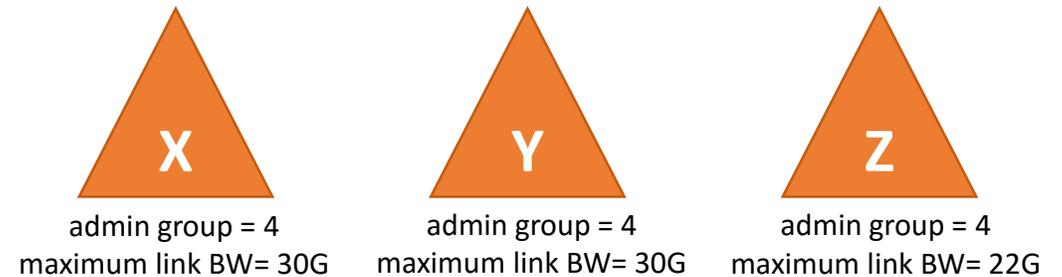


Advertisement from M



admin group = 4 and maximum link BW= 30G are implicitly advertised with TE attribute set ID = 0 (the default TE attribute set).

maximum link BW= 22G is explicitly advertised with TE attribute set ID = 1

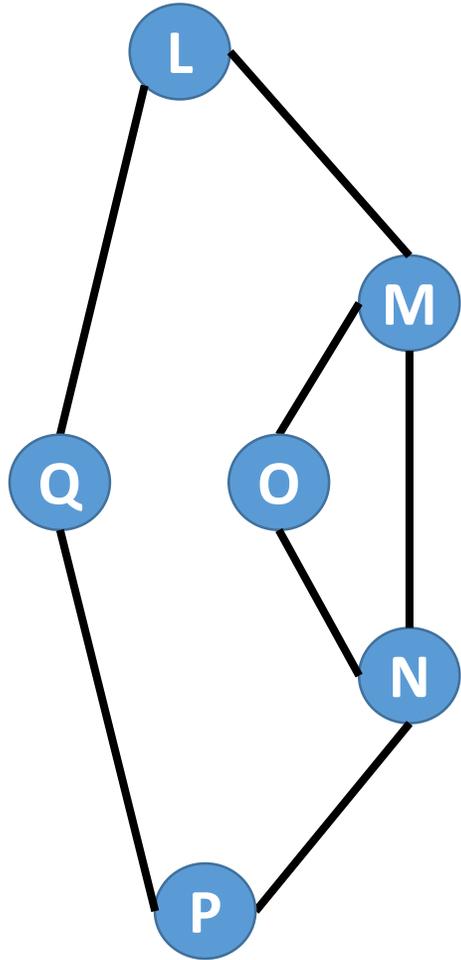


Applications X and Y use the default TE attribute set. Application Z uses TE attribute set =1.

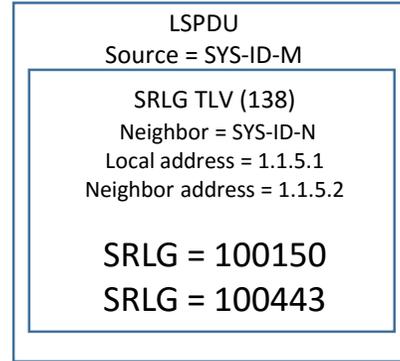
SRLG sets

- SRLGs advertised using TLV#138 are all associated with the default SRLG set (SRLG set ID=0).
- SRLG Set Scoped SRLG TLV is used to associate a non-zero SRLG set ID with SRLGs for a link.
- Each advertised SRLG is therefore associated with an SRLG set ID.

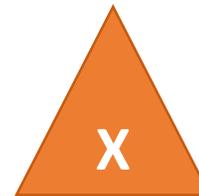
SRLG set usage (1)



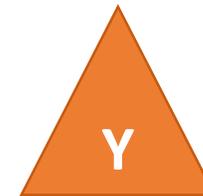
Advertisement
from M



SRLG = 100150 and
SRLG = 100443
are implicitly advertised with SRLG set ID = 0
(the default SRLG set).



X
SRLG = 100150
SRLG = 200443



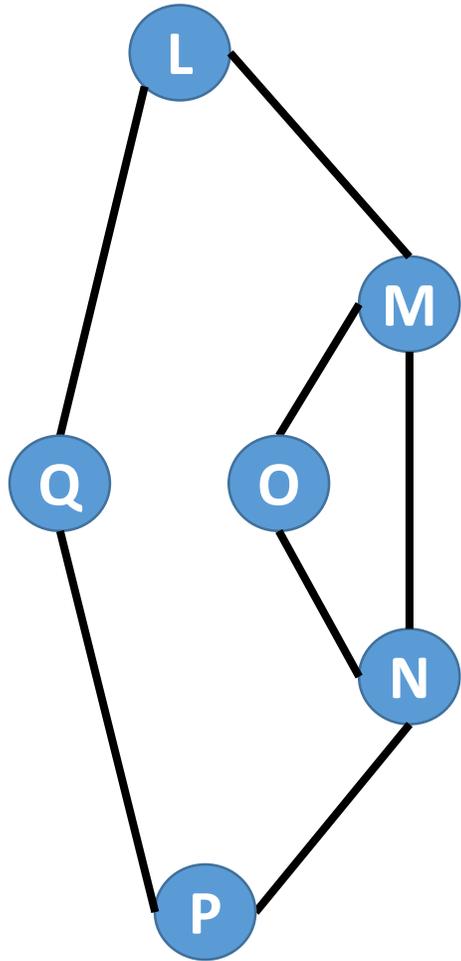
Y
SRLG = 100150
SRLG = 200443



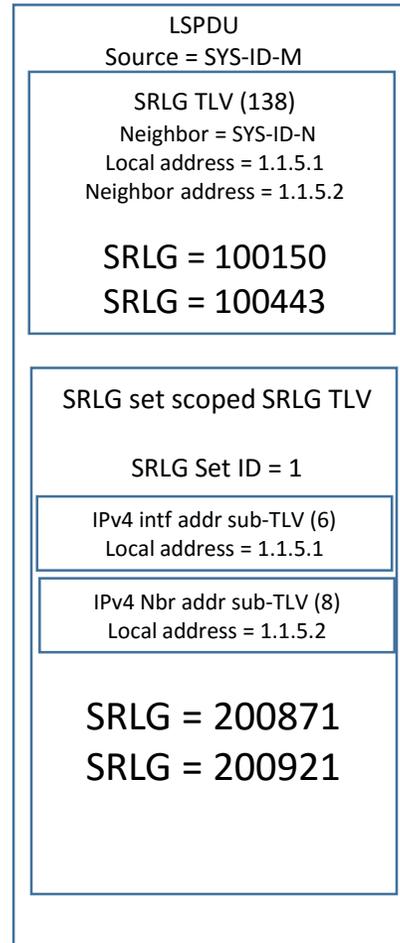
Z
SRLG = 100150
SRLG = 200443

Applications X, Y, and Z all use the SRLGS in the default SRLG set.

SRLG set usage (2)

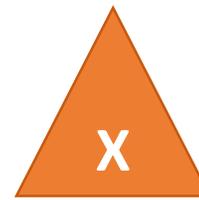


Advertisement from M

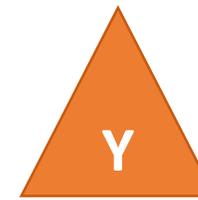


SRLG = 100150 and
SRLG = 100443
are implicitly advertised with SRLG set ID = 0
(the default SRLG set).

SRLG = 200871 and
SRLG = 200921
are implicitly advertised with SRLG set ID = 1



SRLG = 100150
SRLG = 200443



SRLG = 100150
SRLG = 200443



SRLG = 200871
SRLG = 200921

Applications X and Y all use the SRLGs in the default SRLG set.
Application Z uses the SRLGs in SRLG set = 1.

Potential use case for scoped SRLGs (1)

Natural SRLG groupings	SRLG set id
-----	-----
intra-city SRLGs	1
inter-city SRLGs	2
inter-continental SRLGs	3

Requirements:

- Application X should take into account all three groups of SRLGs as path constraints: intra-city, inter-city, and inter-continental SRLGs.
- Application Y should only take into account inter-city and inter-continental SRLGs.

Application	SRLG set ids
-----	-----
X	1+2+3
Y	2+3

Potential use case for scoped SRLGs (2)

Natural SRLG groupings	SRLG set id
intra-city SRLGs	1
inter-city SRLGs	2
inter-continental SRLGs	3

Requirements:

- Application X should take into account all three groups of SRLGs as path constraints: intra-city, inter-city, and inter-continental SRLGs.
- Application Y should only take into account inter-city and inter-continental SRLGs.
- **Application Z should only take into account intra-city and inter-city SRLGs.**

Application	SRLG set ids
X	1+2+3
Y	2+3
Z	1+2

Issues with draft-ginsberg-isis-te-app

- Proposes to eventually deprecate existing TE link attributes in TLV#22.
 - Use cases do not justify an encoding that ultimately deprecates such widely deployed advertisements.
 - Better to use an approach with built-in backwards compatibility.
- Proposed encodings limit attributes to particular applications.
 - Encoding requires routers to advertise which applications should use a given link property.
 - This approach may restrict application development.
 - Better for routers to advertise properties, and let applications decide how to use these properties.
- It is not clear what the definition of each of the “standard applications” should be.
 - Take SR-TE and SR-TI-LFA, or even two different SR-TE applications operating on the same network.

An approach that eventually deprecates existing TE link attributes will be more disruptive than it needs to be

- Existing TE link advertisements are widely implemented and deployed.
- Existing advertisements are already used by many different applications
 - Distributed RSVP-based traffic engineering
 - Centralized RSVP-based traffic engineering
 - RSVP-based Fast Reroute at PLR
 - RSVP-based disjoint paths from ingress router
 - LDP-based Fast Reroute at PLR
 - Centralized SR-based traffic engineering
 - SR-based Fast Reroute at PLR (TI-LFA)
- Use cases identified so far for this new encoding do not justify deprecating the existing advertisements.
- Backwards compatibility section in document is often not sufficient to avoid interoperability issues. Intrinsic backwards compatibility is much safer.

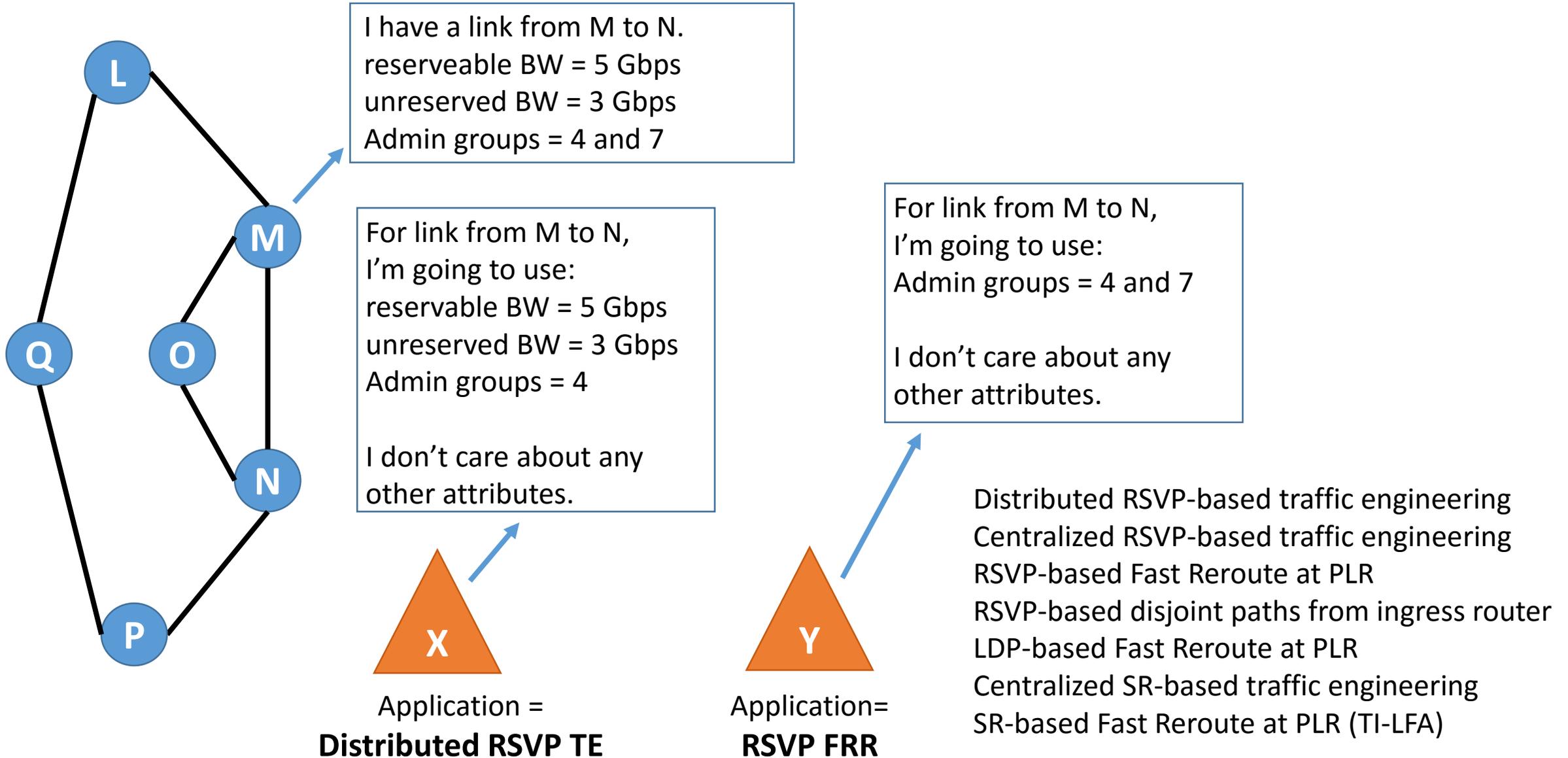
Approach in draft-bowers-isis-te-attribute-set does not lead to deprecating existing advertisements

- In draft-bowers-isis-te-attribute-set, existing TE link attribute advertisements form an integral part of the new framework.
- Existing TE link attribute advertisements form the default TE attribute set (with attribute-set-id = 0).
- If an attribute needs to be advertised as part of a non-default attribute set, then it is advertised using the new encodings.
- This mechanism is similar to the mechanism used for multi-topology routing to provide built-in backwards compatibility.
- Only network operators that want to use the enhanced functionality provided by these encodings ever need to worry about them.

Proposed encodings in draft-ginsberg-isis-te-app limit attributes to particular applications

- Encodings in draft-ginsberg-isis-te-app require that each router identify the applications that are going to use a given attribute.
- The approach used very effectively in the past is for routers to advertise properties, and let applications decide how to use these properties.
- New applications have been developed precisely because they have been able to use information in existing advertisements in new ways.

Experience with different RSVP-based applications



Most concrete use case for these extensions

Natural SRLG groupings	SRLG set id
intra-city SRLGs	1
inter-city SRLGs	2
inter-continental SRLGs	3

Requirements:

- Application X should take into account all three groups of SRLGs as path constraints: intra-city, inter-city, and inter-continental SRLGs.
- Application Y should only take into account inter-city and inter-continental SRLGs.
- **Application Z should only take into account intra-city and inter-city SRLGs.**

Application	SRLG set ids
X	1+2+3
Y	2+3
Z	1+2

- This is the most concrete use case identified for these extensions.
- But draft-ginsberg-isis-te-app is cumbersome to apply to it.

Does it make sense to define “standard applications” in draft-ginsberg-isis-te-app ?

- All of these applications already use the TE attributes and SRLGs:
 - Distributed RSVP-based traffic engineering
 - Centralized RSVP-based traffic engineering
 - RSVP-based Fast Reroute at PLR
 - RSVP-based disjoint paths from ingress router
 - LDP-based Fast Reroute at PLR
 - Centralized SR-based traffic engineering
 - SR-based Fast Reroute at PLR (TI-LFA)
- Do we want to define a “standard application” corresponding to each of these?
- What about two different centralized SR-based traffic engineering applications operating on the same network?
 - Which one is the “standard centralized SR-based traffic engineering application”?