

A photograph of a large industrial factory floor. In the foreground, two large, orange robotic arms are visible, one on the left and one on the right, both positioned over a conveyor belt. The background shows a complex network of orange metal beams and structural supports, typical of a large-scale manufacturing facility. The lighting is bright, and the overall scene conveys a sense of modern industrial automation.

# Segment Routing Flexible Algorithms

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# PROBLEM SPACE

- Ability to create different paths in IGP using different metric types such as te-metric/extended-te-metric
- Separating routing planes
- Constraint based path creation in IGP

# HIGH-LEVEL SOLUTION

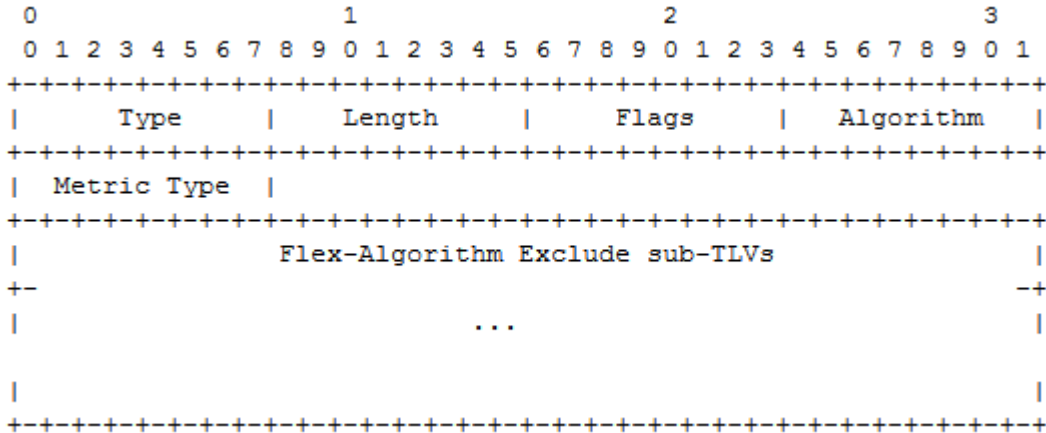
- Segment routing provides mechanisms to advertise Prefix-SIDs based on algorithm
- These Algorithm specific SIDs could follow different metric or different paths
- The SIDs can be used to forward traffic based on application needs
- Algorithm space divided into
  - > Standard based 0-127
  - > User defined 128-255
- All routers in the IGP domain must consistently define the user defined algorithm

# Flexible Algorithm Definition

- Every node advertises the algorithm it supports as part of Router-capability TLV in SR algorithm sub-TLV
- Flexible Algorithm Definition TLV is advertised, by every node or by central controller which is used to ensure consistent definition of the user define algorithm

# Flexible Algorithm Definition TLV

- Sub TLV of Router capability TLV



- Flags are set to 0 and ignored on receipt when advertised as a sub-tlv of 242
- Algorithm: specifies the particular algorithm
- Metric type: To be used for SPF computation.

Currently supported metric types are extended-te-metric (R  
TE-metric (RFC 5305)

# Flexible Algorithm Definition TLV

- Sub TLV of Router capability TLV
  - Receiving Router should match the algorithm definition with it's own
- In case of conflict
  - Must not compute/install any path for the algorithm
  - Should stop advertising support for the algorithm
- Leaking behavior
  - FAD sub-TLVs are not leaked across levels
  - The definition of algorithm **MUST** be same across levels

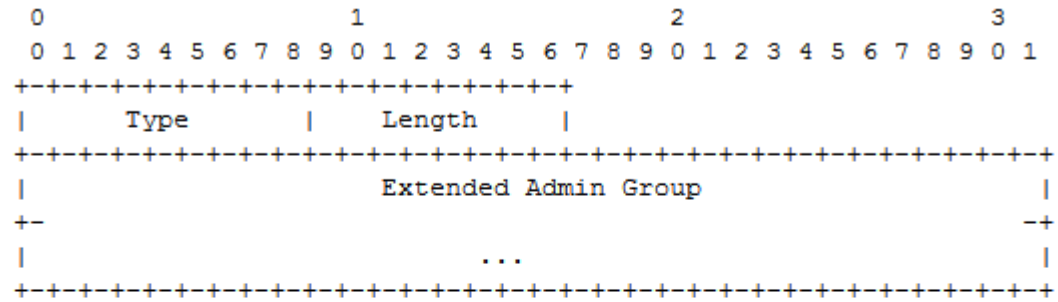
# Flexible Algorithm Definition TLV

- Advertised as Top level TLV
  - Central entity advertises the definition of the algorithm to all nodes
  - Receiving Router should match the algorithm definition with it's local definition if there is local definition.
  - If there is no local definition, Receiving router uses the definition advertised by controller.
  - In case of conflict with local definition
    - Must not compute/install any path for the algorithm
    - Should stop advertising support

```
 0 1 2 3 4 5 6 7
+++++
|S|D|           |
+++++
```

- Flags field in Flexible algorithm Definition TLV used to control leaking behavior

# Sub-TLVs of FAD



where:

Type: TBD3

Length: variable, dependent on the size of the Extended Admin Group. MUST be a multiple of 4 octets.

Extended Administrative Group: Extended Administrative Group as defined in [\[RFC7308\]](#).



# SPF computation

- Separate SPF for each supported algorithm
- In case of conflicts in FAD, must not compute paths for that algorithm
- Nodes that do not support the algorithm are pruned from topology
- Metric type specified in the FAD must be used for computation
- Any exclude link advertisements in FAD should be honored
- SPF restricted to ISIS level
- 'exit' L1/L2 router will be selected based on the best path for the Flex-  
Algo in the local area

# Advantages of Flex-Algo

- With a single SID, Traffic engineered paths can be traversed.
- Per-node configuration of flexible algorithm and constraints.
- Facility to avoid per-node configuration when a controller advertises the FAD TLVs
- Easy inter-area / inter-level support with IGP route leaking.

Questions?