SPB
Traffic Engineering

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Outline

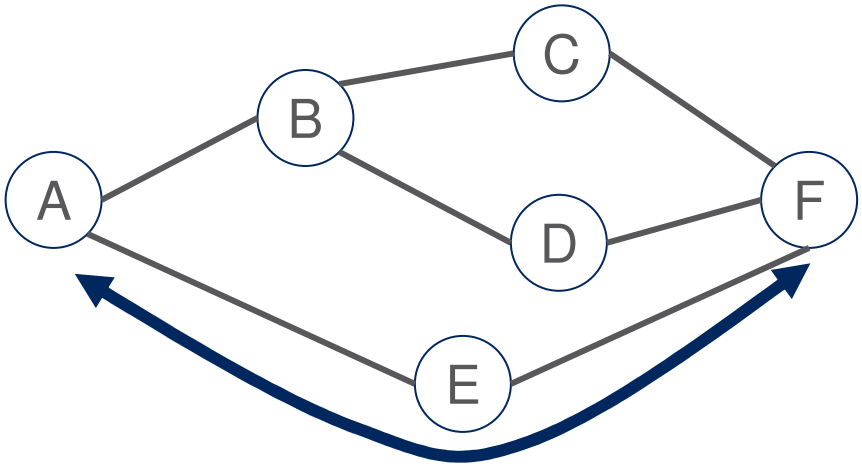
- Scope
- Problem(s) to solve
- Requirements
- Possible operation modes
- Proactive approaches
- Reactive approaches
- Approaches vs. requirements
- Way forward

Scope

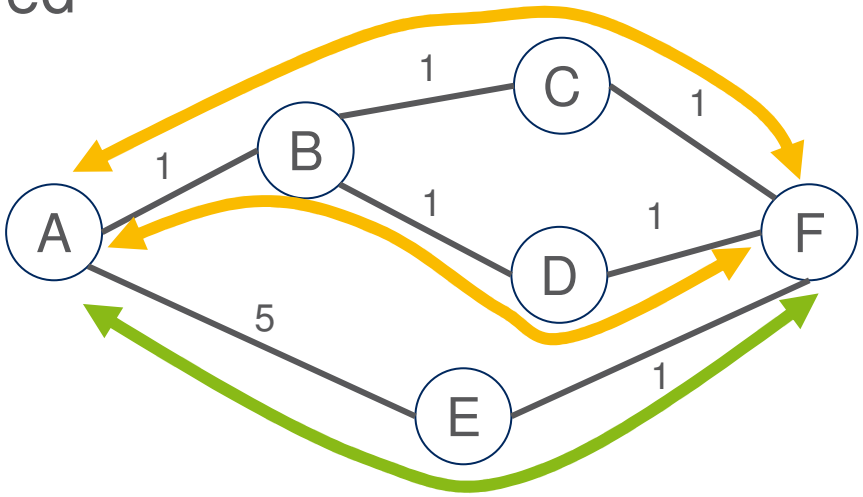
- Provide ability to deviate from the shortest path
  - Resource reservation is not in the scope for now
  - It is referred to as Traffic Engineering
    - Note that full scale TE involves resource reservation too
  - It is also referred to as Traffic Steering
- Goal
  - Provide a knob for Traffic Engineering
- The level of path control may vary
  - *From*: Only specifying which link or node (hotspot) to be avoided
  - *To*: Specifying the entire forwarding path

Problem(s) to Solve

- Only A-E and E-F links are used between A and F
  - Other links could be also used to avoid congestion



- Best-effort traffic could bee steered away from shortest path
  - Premium traffic forwarded on shortest path
  - Best-effort traffic is steered to non-shortest path



Requirements

- Preserve the 802.1Q-2011 service model
  - Symmetric congruence of unicast and multicast
- Minimal modifications to the existing technology base
- Impact on existing traffic minimized
  - Completely hitless if possible
- Minimal impact on the overall scaling and convergence times for the solution

Possible Operation Modes

- Proactive (Design and Assign)
  - Determine the forwarding paths in advance depending on the offered traffic
  - Impact of adding a new flow/service is a priori determined → appropriate forwarding path is chosen
- Reactive (Observe and React)
  - (temporarily) modify the alignment of flow/service to forwarding path
  - Move traffic away from congestion

Proactive Approaches

- Manipulating the shortest path
  - IS-IS Traffic Engineering (RFC 5305)
    - Administratively assigned to have a differently weighted topology to traffic engineering SPF calculations
  - IS-IS Multi-Topology (RFC 5120)
    - Multiple metric sets
    - Shortest path within a metric set
  - Load dependent ECT tie-breaking
    - Balancing the number of shortest paths traversing a link: http://ieee802.org/1/files/public/docs2010/new-allan-load-spreading-for-SPB-0910.pdf
- Specifying the forwarding path
  - PBB-TE coexisting independent to SPB (Ships in the Night (SiN))
    - Something else besides ISIS-SPB is needed, e.g. GMPLS (RFC 6060)
  - ESPs set by SPB (Hybrid SPB and PBB-TE)
    - Protection switching not applied for ESPs if not needed
    - ESPs are “exceptions” for SPB, which may affect convergence time

Reactive Approaches

- I-SID migration from a B-VID/ECT to another
  - Migrate I-SIDs to a less congested B-VID/ECT
- Dynamic metric or link load manipulation
  - Metric manipulation
    - Adjust the cost of a link to steer traffic away from it
    - Iterative, load dependent metric manipulation → **Load Aware Computation**
  - ECT link load manipulation
    - Adjust the link load in the load dependent ECT tie-breaking to steer traffic away from the link
- Selective Topology Override
  - Ability to selectively enhance the mesh density by the provision of "virtual links" that are leaked into IS-IS and treated as real links

Approaches vs. Requirements

Mode	Solution	Supports .1Q service model	Changes existing technology base?	Disruption of traffic	Impact on Scaling	Degree of specification required
Proactive	A priori SP manipulation	Yes	No	Hitless	None	None
	SPB – PBB-TE SiN	Yes	No	Hitless	Significant	None
	SPB – PBB-TE hybrid	Yes	?? (TBD)	Hitless	Significant	Lots
Reactive	I-SID migration	Yes	No	Hitless	None	None
	Metric Manipulation	Yes	No	Large disruption	None	None
	Load Aware Computation	Yes	No	Large disruption	Computationally intensive	Some
	Selective Topology Override	Yes	Yes	Small disruption?	Low	Some

Way Forward

- Investigate further the solution space
- Analyze the open items related to the possible solutions
- Select the preferred approach