Architecture for Use of BGP as Central Controller

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Introduction

BGP (core part of network)
- has link state information, including TE [RFC7752], can compute optimal path
- controls redirection of traffic flows [RFC5575]
- distributes MPLS labels [RFC3107]
- has Route Reflector (RR) [RFC4456]

Using BGP as a controller
- is natural, beneficial and relatively simple to extend BGP to be a controller
- simplifies operations on network
- uses network resources efficiently
- can provide services with high quality
Building Blocks

CSPF: Compute paths for tunnel such as SR or LSP tunnel, satisfying constraints using TEDB

CSPF

TEDB(TED): maintains TE information such as bandwidth for every link in a network.

TEDB

TM

Tunnel Manager (TM):
1) receives request for an operation on a tunnel,
2) gets a path for tunnel,
3) reserves resources,
4) sets up tunnel along path

Tunnel from PE1 to PE4

SLDB: SID/Label Database (SLDB):
records and maintains status of every Segment Identifier (SID) and label for every node, interface/link and/or prefix in the network.

SLDB

TPDB: Tunnel and Path DB (TPDB):
Stores information for every tunnel(Paths, TE resources reserved, SID/Labels assigned, parameters, status).

TPDB

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Reference Architectures

One Controller

Controller Cluster

Hierarchical Controllers
One Controller

Ia: gets paths for tunnel from a source to a destination, satisfying constraints

Ib: Reserves/releases TE resources for tunnel

Ic: Reserves/releases labels for SID/Label

Id: stores/updates info for tunnel

In: Creates/deletes tunnel along path
   TEDB gets initial TE info of network
   SLDB gets initial labels info of network

Tunnel from PE1 to PE4

API to Network (BGP/RR+)

CSPF

BGP Controller

TM

TEDB

SLDB

TPDB

Id
Controller Cluster

Users/Applications (Orchestrator/OSS/NMS)

Controller Cluster

Primary BGP-based controller

Secondary BGP-based controller

API (BGP/RR+)

Tunnel from PE1 to PE4

PE2

PE3

PE4

PE5

PE1
Hierarchical Controllers

Parent/upper controller

- Optimal E2E Path Computation
- E2E Tunnel Creation/Deletion/Update
Next Step

Welcome Comments