Centrally Control Dynamic Routing Scenario, Simulation and Suggestion (https://tools.ietf.org/html/draft-wang-teas-ccdr-00)

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Contents

• CCDR Scenarios(four)
• CCDR Simulation(topology,traffic,results)
• CCDR Suggestions
CCDR Scenario-1
QoS Assurance for Hybrid Cloud-based Application

Description:
• Enterprise A and B rent some cloud resources from public cloud, they both have their own private cloud that located in different POPs of service provider.
• These enterprises are connected via the exist Internet access line.
• There are other background traffics within the network connected these POPs, the background traffic is varied from time to time.
• The communication between Private and Public cloud may be burst and require end to end QoS assurance
CCDR Scenario-2
Increased link utilization based on tidal phenomena

Description:
• Different kind customers are under different network devices.
• The traffic behavior of these customers are periodic, lead to the unbalance of link utilization.
• Service Provider needs to improve the overall link utilization, reduce the cost of long haul links via the local loop links under the help of SDN controller.
CCDR Scenario-3
Traffic engineering for IDC/MAN asymmetric link

Description:
- Link utilization between IDC/BackBone, MAN/BackBone are asymmetric.
- There are redundant links between MAN and local IDC.
- Some traffic can be diverted from asymmetric link.
- Such traffic engineering should be accomplished under global view of the network.
- Traverse multi-domain
CCDR Scenario-4
Network temporal congestion elimination

Description:

• Within Native IP Network, traffic between two endpoints always follow the IGP shortest path.
• Traffic varies in real time but has some periodicity.
• Some links will always encounter congestion while others will always underutilization.
• Service provider should find some efficient ways to schedule part of the traffic out of the congesting link.
• This will certainly increase the average link utilization and application’s performance.
CCDR Simulation
Topology Simulation

Description:

- 100 core nodes (Blue) and 400 edge nodes (Green).
- 20000 links: Core nodes are full mesh. Edge nodes have 2 to 30 up-links.
- The bandwidth of all links is set to be 100Gbps.
- The link metric between core nodes is from 60 to 100. The link metric between core and edge nodes is from 1000 to 1060.
- Link congestion threshold is set to be 0.8 for core nodes, to be 0.9 for core/edge nodes.
Description:

- The end-to-end network traffic is a 500*500.
- The components of traffic matrix are generated from 10Mbps to 7Gbps randomly.
- About 20% links are overloaded when the Open Shortest Path First (OSPF) protocol is used in the network. And the average congestion degree of all overloaded links is about 10%.
CCDR Simulation
End-to-End Path Optimization Result

Description:

• 1000 flows arrived in 6 periods: 100, 200, 100, 250, 150 and 200 flows in each period. The size of flows is from 10Mbps to 10Gbps.

• The end-to-end path optimization has an eye-catching decreasing in link utilization relative to the path chosen based on OSPF.

Note: "Increased link utilization" is equal to the sum of the congestion degree of the links that the flow passes.
CCDR Simulation
Network Temporal Congestion Elimination Result

Description:
• Before optimization, the average congestion degree of all congested links is more than 10%.
• After optimization, the average congestion degree of all congested links is less than 2%.
• The degree of network congestion is greatly eliminated.
Solution Consideration

✓ It is feasible to apply PCE within native IP network.
✓ The solution should be easy to deploy within one domain or span multi-domains.
✓ The solution should decrease the complexity of distributed network protocol.
✓ The solution should lower the burden on network devices.
✓ Draft PCE in Native IP network and BGP Community PCE begins the solution exploration.
Further Action

• Are these enough to start CCDR related standardization activities?
• Adopt solution draft [PCE in Native IP network](mailto:PCE in Native IP network) as WG draft?
• Further exploring the related scenarios?
• Comments?

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