Progress report: Load-Balanced Shortest-Path-Based Routing Without Traffic Splitting in Hose Model

Oki lab
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Previous seminar (S-OSPF)

- Traffics are distribution in Source node.

Split traffic with optimum distribution-ratios.

Source 1 ▶️ Destination 1

Source 2 ▶️ Destination 2

Shortest-path routing.
Previous seminar (Hose model)

- The maximum rate of traffic that incoming/outgoing network is known.
- Each link traffics are not known.
Problem of S-OSPF

- Traffic demands
  - S-OSPF has to know the each link traffics to determine the optimum distribution ratios.
- Implementation
  - Most existing routers are unable to split traffic with different distribution ratios into multiple routers.
Load-balanced shortest-path-based routing without traffic splitting in hose model

- Choose the best neighbor which can load-balancing in source node.
Problems of proposed scheme

- To choose best neighbor, we have to solve Integer Linear Programming (ILP) Problem.
- In hose model, we can not know link traffic demand.
Heuristic algorithm

- To solve the ILP, we use heuristic algorithm.
- This algorithm solve the LP to get worst traffic case when choose neighbor.

1. Solve the split S-OSPF.
2. Use the result of Step1, each source and destination pair is classified into non-split and split group.
3. Select the source and destination pair which has the largest incoming and outgoing traffics in split group.
4. Choose the neighbor which can minimize the worst congestion ratio.
5. If congestion ratio less than 1.0, move the pair split group to non-split group. Otherwise no feasible solution is not found.
6. If split group is not empty, goto step 3. Otherwise the solution is found.
Evaluation

- Calculate congestion ratio in Sample network
  - Target scheme:
    - Shortest Path Routing
    - S-OSPF
    - Non-split S-OSPF (Proposed scheme)
  - LP solver
    - CPLEX
  - Target Network
    - Network 1 - 6 (show next slide)
    - Random traffic demands.
Sample network

(a) Network 1

(b) Network 2

(c) Network 3

(d) Network 4
Sample network (cont.)

(e) Network 5

(f) Network 6
Evaluation result

- Split S-OSPF and non-split S-OSPF are Normalized by classical SPR.
Evaluation result

- Proposed scheme reduced congestion ratio compared to SPR.
- Different of split and non-split is closed in large network.
Future works

- Simulation(by 10/15)
  - Measure calculation time
- Implementation(by December)
  - Implement non-split S-OSPF
  - Evaluate proposed scheme in real network
Conclusion

- Show the problem of S-OSPF.
  - Most exist router can not distribute traffic into multiple paths.
- Propose the non-split S-OSPF.
  - This scheme choose the one neighbor which can load-balancing.
- Show the heuristic algorithm.
- Show the evaluation.
  - Proposed scheme reduced congestion ratio.
  - In large network, performance looks like split S-OSPF.