Traffic flow aggregation for traffic engineering

~Classifying flows based on traffic variation pattern~

Abstract

Although the use of software-defined networking (SDN) enables routes of packets to be controlled with finer granularity by using traffic engineering (TE), the corresponding increase in the number of states that need to be managed at routers and controller is problematic in large-scale networks. Aggregating flows into macro flows and assigning routes by macro flow should be an effective approach to solving this problem. However, when macro flows are constructed as TE targets, variations of traffic rates in each macro flow should be minimized to improve route stability. We propose to cluster micro flows with similar traffic variation patterns into groups and optimizes the traffic ratio of extracted from each cluster to aggregate into each macro flow.

[1] Flow clustering

Clustering analysis based on traffic variation pattern

TS: time slot
MF: macro flow

R f,t: amount of traffic of flow f in TS t
R f = (R f,1, R f,2, R f,3, R f,4, R f,5)

Flow cluster
Macro flow

Optimize ratio of traffic extracted from each flow cluster minimizing traffic variation of macro flows
Generates stable macro flows by aggregating flows with different traffic variation pattern

[2] Optimizing ratio of traffic extracted from each cluster

Derive ratio of traffic extracted from each cluster minimizing maximum traffic of MF

Maximize traffic of MF m

Assign flows realizing optimum extraction ratio

[3] Aggregating flows into MF

Assign flows realizing optimum extraction ratio

Minimize deviation from optimum

This work was supported by the Ministry of Internal Affairs and Communications of Japan.

Related works


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