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# A forwarding graph embedding algorithm exploiting regional topology information

**Key words:** Network function virtualization; Virtual network function; Forwarding graph embedding

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### Motivation

- Network function virtualization (NFV) is a newly proposed technique designed to construct and manage network functions dynamically and efficiently.
- Allocating physical resources to virtual network function forwarding graph is a critical issue in NFV.
- We formulate the forwarding graph embedding (FGE) problem as a binary integer programming problem, which aims to increase the revenue and decrease the cost to service provider while considering limited network resources and the requirements of virtual network functions.

#### Main idea

- The FGE problem is formulated as a binary integer programming (BIP) problem, which takes resource capacity of the substrate network and resource constraints of FGs into consideration.
- A regional resource clustering metric is designed to evaluate the embedding potential of substrate nodes, and an efficient topology-aware heuristic FG embedding algorithm based on that metric is proposed.
- A genetic algorithm based heuristic algorithm is also proposed to maximize the long-term economic benefits.

### Method

- 1. The objective of the proposed BIP model is to minimize embedding cost.
- 2. The constraints of the BIP model are the physical resource constraint, resource requirement constraint, and flow constraint.
- 3. We formulate the forwarding graph embedding problem as a binary integer problem, and use a topology-aware heuristic algorithm (Algorithm 1) to find an approximate solution.

#### **Major results**

• The proposed algorithm reaches a higher request acceptance ratio than existing algorithms



## Major results (Cont'd)

 The proposed algorithm reaches higher profits to the service provider.



#### Conclusions

- The FGE problem is a critical problem in network function virtualization.
- We formulate the FGE problem as a BIP problem and propose two heuristic embedding algorithms to solve it.
- Experiments demonstrated the efficiency of our proposed embedding algorithms in terms of the acceptance ratio and profits to the service provider.