Early Classification of Network Traffic for Software-Defined Network Management

Motivation

- The paradigm of Software-Defined Networking (SDN) is increasingly gaining attention as a technology for the future networks.
- OpenFlow has evolved to become today’s main enabler of SDN.
- Due to the increasing interest of OpenFlow, the major vendors of network devices have incorporated OpenFlow support into their switches and routers.
- Traffic classification is crucial for network management tasks, such as traffic engineering or capacity planning.

Objectives

- Early classification of traffic as elastic / inelastic in SDN networks.
- Use OpenFlow protocol for network management.
- Use only first few packets of each flow (TCP or UDP) for classification.
- Automatic reconfiguration of the OpenFlow devices.
- Low computational and bandwidth overhead.
- Highly scalable system.

Introduction

Combination of flow-level and packet-level data as input for traffic classification with OpenFlow.

Methodology

Flow-level input

- Unidirectional flows are identified by a 5-tuple (source and destination IP, source and destination ports, protocol).
- Combined classification techniques:
  - IP-based
  - Service-based
  - Host-behavior-based
  - Machine learning-based (e.g., C4.5 or C5.0 decision trees)
  - ... Flow-level as a complement of packet-level techniques.
  - Lightweight but slower classification.

Proposed system

The SDN monitoring system collects first few packets of each flow (TCP or UDP) with OpenFlow.

Early classification of elastic and inelastic traffic and generation of a ground-truth for other techniques as machine learning-based ones.

The SDN monitoring system checks the flow tables of the OpenFlow devices and reconfigures the SDN controller (e.g., to prioritize inelastic traffic).

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