Measurement and Analysis of Modern Web Traffic and Network Protocols

HTTP/2 traffic characterization and classification

Motivation
- Understanding modern web traffic
- Building traffic models for benchmarking and simulations
- Network management and provisioning
- Track the adoption of HTTP/2

Challenges
- DPI methods are expensive
- Prevalence of encryption

State-of-the-art
- Active probing

Proposed Solution
- Flow-based classification method
- Machine learning using passive measurements

Findings
- On average, HTTP/2 flows are more than 30% longer, carry more packets and have smaller packet size than HTTP/1. HTTP/2 is dominant in popular web applications

Flow-based classification
- Features: Number of client bytes, server bytes, client packets, server packets, average client bytes per packet, average server bytes per packet, flow duration.

Findings
- Decision trees are suited for classification of HTTP protocol. C4.5 has the fastest classification speed
- C4.5 and Random Forest exhibit good temporal stability

HTTP/2 performance improvement using Multipath TCP

Problem
The design of a single HTTP/2 connection can lead to poor performance in certain network conditions

Objectives
- Experiment with parallel HTTP/2 connections natively in web browser.
- Explore MPTCP for parallel HTTP/2 subflows.
- Measure the effect of congestion control algorithms on performance.
- Test diverse real-world network conditions:
  - Congestion in ISP network
  - Random packet loss in WiFi
  - Bufferbloat in LTE network
- Devise application and network-aware path selection in MPTCP

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