FlowQoS: Not Every Flow is Born the Same

UCSDCSE Computer Science and Engineering

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Motivation

• Traffic from one application might not share the same characteristics as the traffic from another.

• Mechanisms to perform QoS functions are not based on specific application, devices, or users.

• Modern devices only support DSCP-based QoS requiring applications to proactively set the right fields in IP header.

Solution

• Isolate different traffic in separate queues each having a hard rate limit on that traffic.

• Openflow-based isolation and OVS ingress policing for rate limiting traffic.

• Utilize the Linux's advanced routing and traffic control to overcome the limitation of under-utilization of available bandwidth.

FlowQoS Classification & Rate Control

• Users configure priorities for specific high-level applications.

• The output from the portal is a configuration file that the rate shaper uses for shaping traffic.

• Enables per-class QoS by creating a two-switch virtual topology.

• Each link corresponds to a different traffic class and is rate-limited to the user-specified rate.

• Classification uses DNS records for HTTP traffic and first 4 bytes of the flow in either direction.

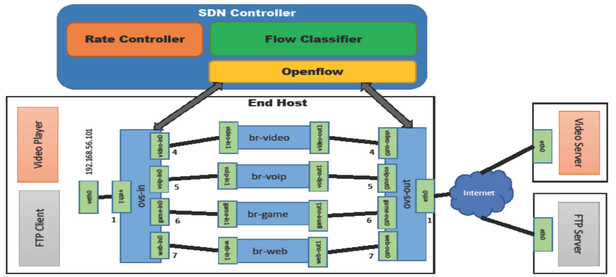
Linux Traffic Control

• Provides a handle **tc** for Linux kernel's network scheduler for low-level manipulation of network traffic flowing through it.

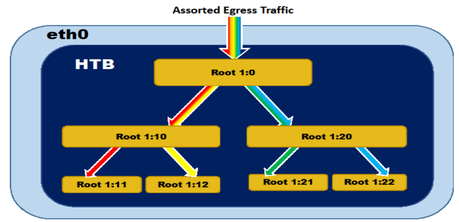
• Implements multiple queuing disciplines, traffic policers and shapers to provide QoS to matching traffic.

• HTB is classful queueing discipline that supports multi-level traffic classification and shaping on egress traffic at an interface.

FlowQoS Architecture

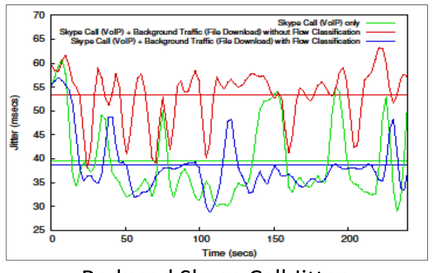


Heirarchical Token Bucket (HTB) Traffic Flow

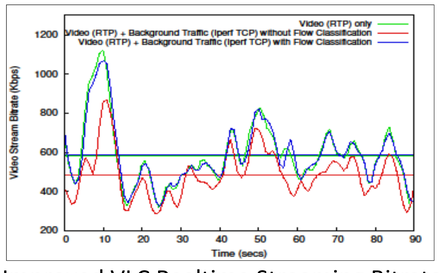


Results

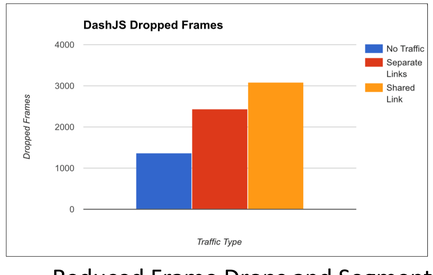
Improvements to Application Performance using OVS-Openflow Classification

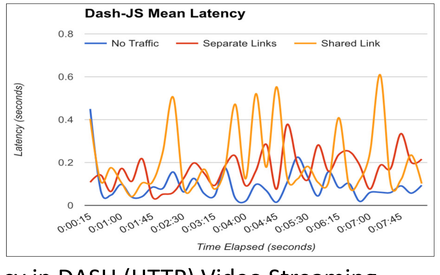


Reduced Skype Call Jitter



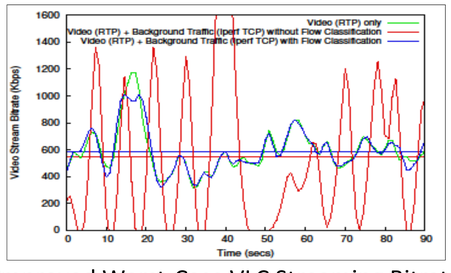
Improved VLC Realtime Streaming Bitrate



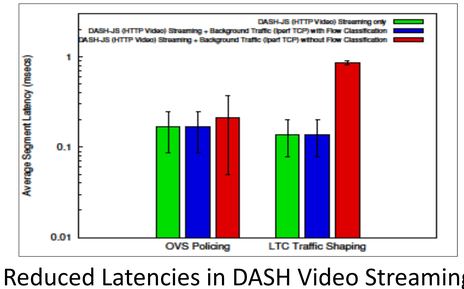


Reduced Frame Drops and Segment Latency in DASH (HTTP) Video Streaming

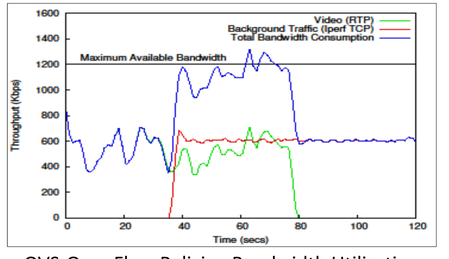
Additional Gains from using Hierarchical Token Bucket (HTB) in Linux Traffic Control



Improved Worst-Case VLC Streaming Bitrate

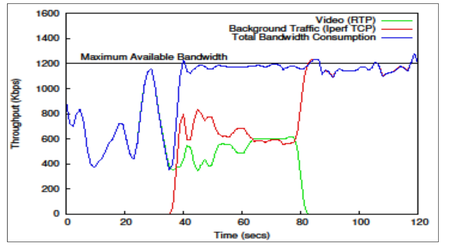


Reduced Latencies in DASH Video Streaming



OVS-OpenFlow Policing Bandwidth Utilization

Efficient Bandwidth Utilization



HTB Traffic Shaping Bandwidth Utilization