Adaptive Bit Rate (ABR) Video Detection and Control

In recent years, Internet traffic has changed dramatically and this has impacted service providers and their ability to manage network traffic. The move to encrypted video traffic, and to new protocols (fast-growing UDP) coupled with exploding video traffic growth make traditional methods of optimization and management difficult for service providers. This increases the need for improved traffic management capabilities, not only to optimize their network, but also to roll out new services that they can monetize.

Key trends

Increase in encrypted traffic

In Figure 1, the data from the aggregate traffic due to the top 10 applications shows that five of the top six applications (YouTube, Facebook, SSL–Other, Google Cloud and Snapchat) are encrypted. HTTP 2.0 is being standardized in the IETF and HTTP 2.0 connections will be TLS encrypted. SSL traffic is close to 50% of total internet traffic and rapidly rising.

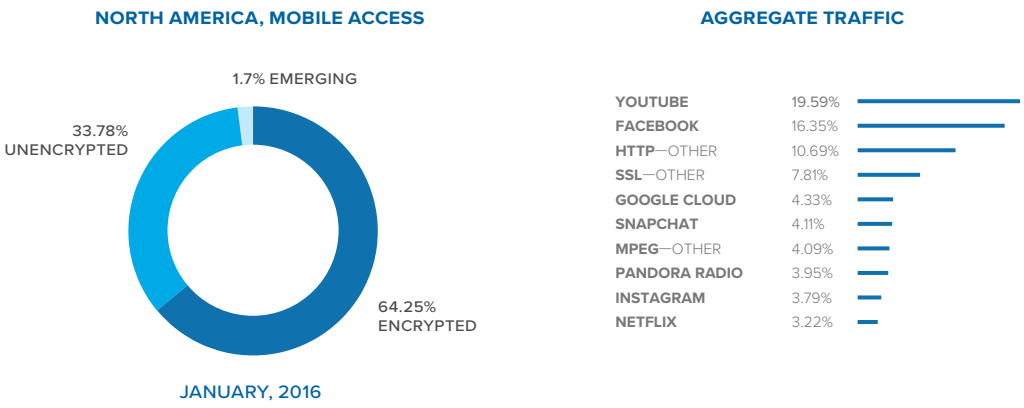

Figure 1: Encrypted Traffic Composition in North America–Mobile Access & Aggregate Traffic in North America, Mobile Access (Source: Sandvine)

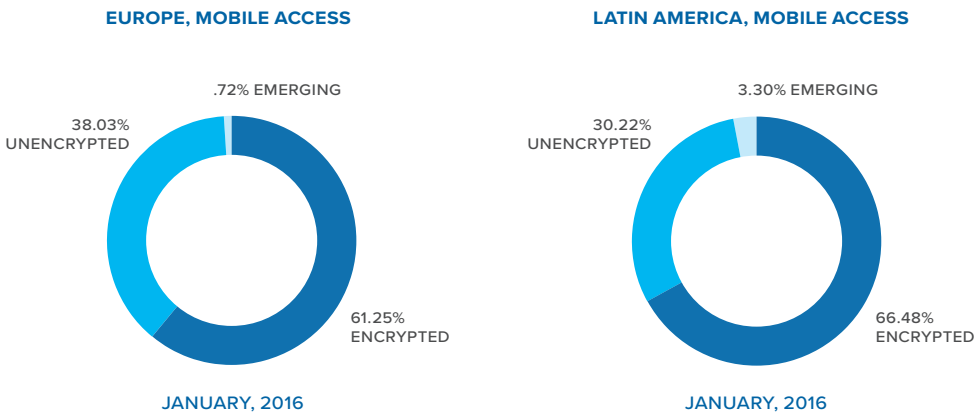

Figure 2: Encrypted Traffic Composition Europe and Latin America, Mobile Access
(Source: Sandvine)

The main reasons for encryption or HTTPS-based services are security (i.e. a media request cannot be intercepted), privacy (viewing habits cannot be inferred by inspecting traffic), and popularity (Google page rank favoring sites delivered under HTTPS). The growing rate of encrypted traffic carried over service provider networks is causing fundamental shifts in content and diminishing mobile operators' general network and content management capabilities.

Increase in UDP/QUIC traffic

Traditionally, a majority of video traffic has been TCP-based. Hence, most optimization/traffic management methodologies tune themselves to handle TCP traffic. In recent years, there has been an increase in UDP traffic on operator networks. Google developed the QUIC (Quick UDP Internet Connections) protocol to enhance user experience and overcome some of the inherent issues with TCP to handle real time web applications. QUIC supports a set of multiplexed connections between two endpoints over UDP and was designed with the promise of secure (TLS/SSL), low latency connections with better loss recovery and congestion control mechanisms. YouTube is driving a large part of QUIC-based traffic on mobile networks, comprising close to 20% of network traffic per recent stats.[1]

It is important to note that QUIC is now being standardized in the IETF, which will accelerate its growth in coming years. Therefore operators need to have better mechanisms to deal with the growing UDP traffic.

[1] FierceWireless, April 2017

Video traffic dominates Service Provider traffic

Mobile operators are grappling with huge amounts of video traffic.

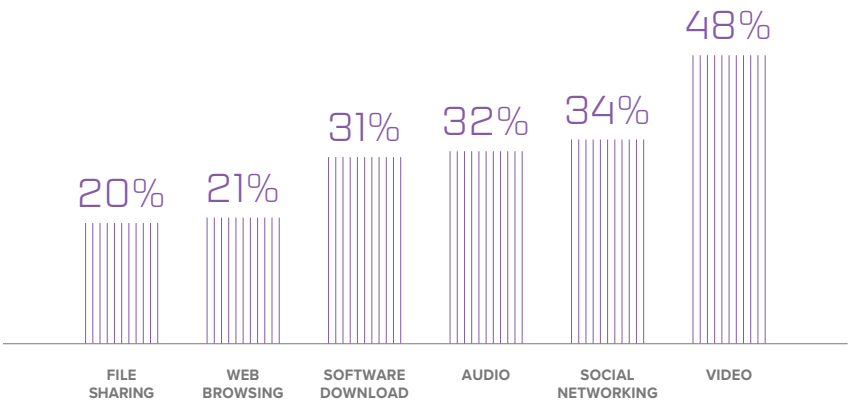

Figure 3: Mobile Traffic by application category
(Source: Ericsson Mobility Report November 2017)

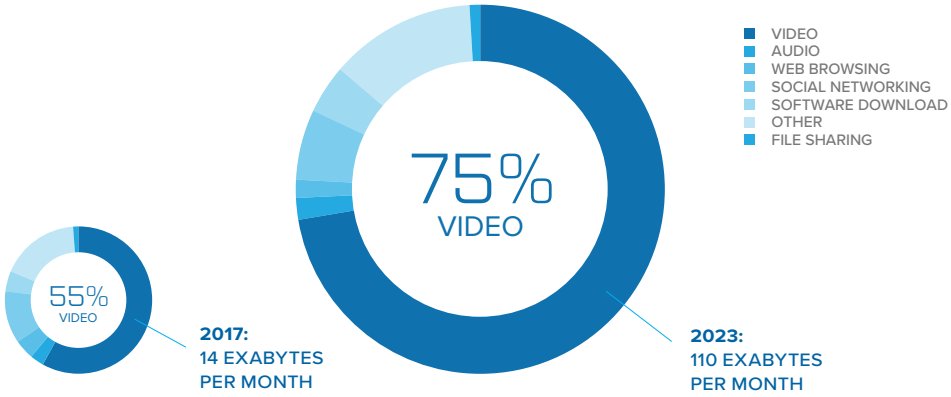

Figure 4: Mobile Data Traffic by Application Category per month
(Source: Ericsson Mobility Report November 2017)

Mobile video traffic is forecast to grow by around 50% annually through 2023 to account for 75% of all mobile data traffic.[2] Increased viewing of video on mobile devices, embedded video, and emerging video formats are driving data consumption, fueled by larger device screens, higher resolution, and new platforms supporting live streaming. Internet video services such as Hulu, Netflix, Facebook, and YouTube, as well as gaming and webcams, are among the most common mobile video applications. The emergence of new applications and changes in consumer behavior can shift the forecast for traffic volumes. Streaming videos in different resolutions can also impact data traffic consumption. Watching HD video (1080p) rather than video at a standard resolution (480p) typically increases the

[2] Ericsson Mobilty Report, November 2017

data traffic volume by around four times. An emerging trend with increased streaming of immersive video formats, such as 360-degree video, also impacts data traffic consumption. For example, a YouTube 360-degree video consumes 4 to 5 times as much bandwidth as a normal YouTube video at the same resolution.

Rise of Adaptive Bit Rate Video streaming

Top video sites like YouTube, Netflix, Hulu, and Facebook have embraced ABR video technology. ABR video has surpassed progressive download video and is projected to be close to 90% by 2018. In ABR video technology, the client adaptively selects the appropriate bit rate based on current network conditions and device capabilities. ABR formats include Dynamic Adaptive Streaming over HTTP (DASH), which is the MPEG and 3GPP standardized version, and proprietary technologies such as Apple HTTP Live Streaming (HLS) or Microsoft Smooth Streaming (MSS).

Impact of these trends on Service Providers

The move to encryption, the new traffic protocol mix (like fast-growing UDP) coupled with exploding video traffic growth means that service providers are facing new challenges:

- Keeping the network, primarily the premium RAN resources, optimized to handle the increasing traffic/video
- Ensuring that subscriber QoE is always maintained–having effective controls to prevent congestion
- Ability to deal with sudden huge traffic surges via network capacity and service reliability (for example, a city hosting the Olympics)
- Ability to offer differentiated services to different subscriber tiers

Figure 5: Mobile operators' top concerns

One of the top concerns for mobile operators is the ability to monetize and differentiate their offerings while dealing with these trends. Today, when a user watches video, in most cases, it is encrypted ABR video, and that video is consuming valuable radio resources for the mobile operator. Hence, for service providers, the ability to detect and control ABR video traffic would be very valuable since it provides them the ability to optimize their network and save network resource savings, while maintaining subscriber quality of experience.

How does ABR video work?

In ABR, the source video is divided into small, individually addressable and cacheable chunks and then encoded in different bit rates on the streaming server. The client uses a prediction algorithm to estimate the network bandwidth that will be available to download the next video chunk, based on the observed network throughput for previous video chunks. The advantage of ABR is that a video streaming service can offer higher quality when the network conditions allow. Conversely, when the network conditions are challenged, a lower bit rate format is streamed. The lower bit rates ensure service continuity because subscriber viewing experience is not degraded. There is a significant improvement in video QoE.

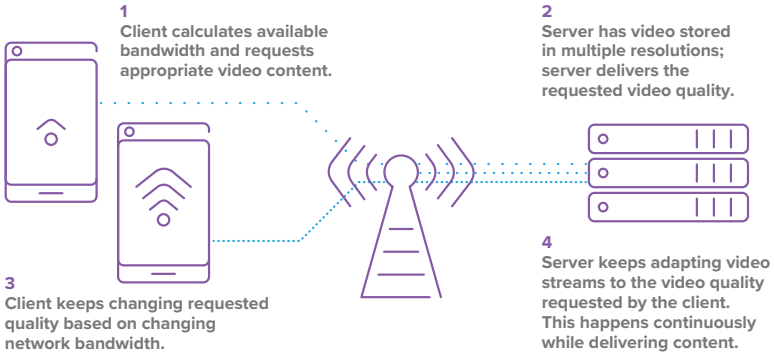

Figure 6: How does ABR video work? It's all about maintaing QoE

The F5 Solution

The F5 solution can help service providers to better manage their network traffic. F5 BIG-IP Policy Enforcement Manager can detect video streams (including ABR video) and dynamically manage them using TCP-proxy based bandwidth controls or flow shaping capabilities for UDP- based video streams. These capabilities, along with other F5 functionality enables service providers to future-proof their investment for video traffic management. This provides service providers the ability to detect ABR video and control the amount of bandwidth used by video in the network, providing network resource savings—especially premium RAN resources—while maintaining a quality user experience.

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