Adaptive Codecs -- Good for Users, Bad for Networks

The quality of experience for cloud-based team collaboration tools is poor for many enterprise users. This needs to change!



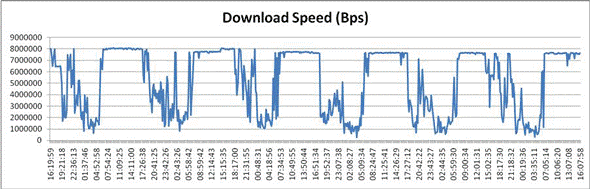
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July 12, 2018

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Network managers have the responsibility of providing a high-performance, reliable, and secure network for the enterprise, but they have less and less control of what runs over it. Talk with any network manager about his or her top three problems, and collaboration tools are on this list. Adoption of freemium, cloud-based collaboration tools by an increasing number of user groups is exacerbating the "wave" effect on enterprise networks. This is because these tools use adaptive codecs for voice and video sessions.

The wave effect occurs when network utilization hits 100%, backs off, then hits 100% and backs off again in a continuous cycle. For example, TCP windowing starts the wave effect with a TCP session creating a large window and then backing off once a few packets are dropped. Having many flows across a single network link leads to large waves. Waves are problematic because every time network utilization hits 100%, applications are impacted, including those critical to running the enterprise.



Adaptive codecs do the same thing but are worse because their back-off intervals take longer. An adaptive codec will first utilize forward error correction (FEC) and send more packets before it backs off. When a 1-Mbps videoconference experiences packet loss, for instance, the session will burst up to 3 Mbps for 10 to 15 seconds before backing down to 512 Kbps (by reducing resolution and/or frame rate).

Adaptive codecs work very well when only a few sessions are running on a network. Get lots of sessions together on a single network pipe, and waves occur if the network pipe isn't big enough.

Many WAN optimizers do a good job managing TCP windowing, but struggle to manage real-time UDP optimization used by adaptive codecs. Compounding the problem, team collaboration tools use TLS or D-TLS encryption. Both make identification of the voice, video, and data traffic very difficult within the encrypted tunnel.

Traditional network gear doesn't solve the adaptive codec wave problem. While call admission control (CAC) can limit the number of concurrent voice and video sessions on an internal collaboration system, it doesn't work on over-the-top cloud-based solutions. Unlike voice, which is a fairly regular stream, video has huge bursts of traffic.

Software-defined WAN (SD-WAN) players such as **[CloudGenix](https://www.cloudgenix.com/" \t "new)** and **[Talari](https://talari.com/" \t "new)** are building in flow intelligence to be able to solve this problem in real time. They can:

1. **Send traffic across multiple paths** based on network packet loss, latency, and jitter
2. **Prioritize voice above video** and rate-limit the video as required, especially across networks that aren't honoring the DiffServ QoS settings, even within a WebRTC D-TLS stream
3. **Identify and control real-time traffic**, even if it's coming from a cloud provider, based on flow characteristics -- voice, for example, has packets of a fixed size that come at a fixed increment of time
4. **Report mean opinion scores** (MOS) for each voice and video session for real-time alerting and long-term tracking

One enterprise network manager told me last week that users love Cisco's Webex Teams (formerly known as Spark), but their Cisco WAN can't manage the traffic effectively, causing intermittent voice on conference calls. It's OK for video and data traffic on a conference session to get delayed, but any interruption in the voice traffic has a direct impact on the QoE of the conference call.

Enterprises have three options for solving the adaptive codec wave problem caused by cloud-based collaboration tools:

1. **Block it --** Put strict firewall rules in place and try and block all cloud-based collaboration tools
2. **Overbuild --** Add big networking pipes so network congestion doesn't occur
3. **Use SD-WAN --** Dynamically manage the voice and video traffic riding the network

Option 3 is emerging as the most popular, since blocking traffic only makes IT more unpopular than it already tends to be and overbuilding leads to spending too much. The emerging SD-WAN vendors can solve this problem elegantly with new ways of doing bandwidth shaping across multiple paths, while monitoring the quality of every session. Traditional network vendors will reroute a voice/video session only if the link is down, while leading SD-WAN vendors can reroute traffic in less than a second to a better path if dropped packets or jitter exceeds a pre-defined threshold.

In its seventh-annual [**Global Cloud Index**](http://www.cisco.com/c/en/us/solutions/service-provider/visual-networking-index-vni/index.html), Cisco says that by 2020, 82% of all IP traffic (both business and consumer) will be IP video. Managing video and the waves of traffic caused by adaptive codecs is one of the drivers of the SD-WAN market.

------------------------------------------------------------------------------------------------------------------------------------------Video occupies about 75% of the data transmitted on IP-networks and that percentage has been steadily growing and is projected to continue to grow further. Introduction of ultra-high definition (UHD), high dynamic range (HDR), wide color gamut (WCG), high frame rate (HFR) and future immersive video services have dramatically increased the challenge. Therefore, the need for highly efficient video compression technologies are pressing and urgent issue. As an answer to this challenging request the video coding performance improves around 50% every 10 years under the cost of increased computational complexity and memory.