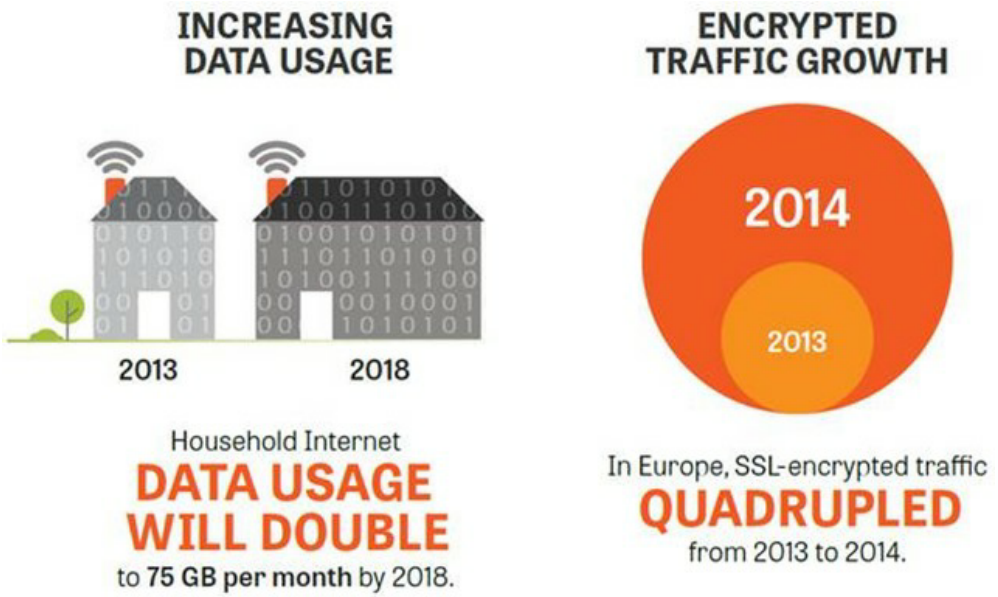
Encrypted Content Cannot be Optimized, but the Delivery Platform Can

Frank Yue, 2015-24-06

#LTEWS #TCPOptimization Someone recently asked me about TCP optimization and what it really was and why it was important for today's networks. I have previously written a blog post about how TCP optimization can improve the delivery of content to the consumer. Now, let's go into a little detail as to why we need TCP optimization and how it works.



As you can see in the graphic, traffic on the internet is growing at a phenomenal rate and we do not expect the rate to slow down anytime soon. Second, we see that the percentage of traffic that is being encrypted is continuing to increase as well.

The issue of encryption is a key point to discuss. Today, service providers use a variety of methods to improve the delivery of content. They have video optimization solutions that adjust the compression rate to decrease the volume of traffic while still maintaining the visual quality for various devices. They use caching technologies to store content that is accessed repeatedly to improve response times and reduce the redundant fetching of data. They implement compression algorithms to reduce the volume of non-optimized content such as text and images.

The problem with these technologies is two-fold. First, the technologies only work for certain types of traffic that they can understand and improve. Second, when the traffic is encrypted, none of these technologies work. The ability to adjust the content requires the ability to see and manipulate this content. Thus, when application providers and consumers encrypt the traffic, all the content-based optimization technologies break.

TCP optimization works by improving the TCP protocol stack. This does not require content inspection and can be done on any TCP traffic, which accounts for over 95% of the traffic on the Internet. The TCP protocol can be improved because it was developed in the 1970s when networks looked and behaved very differently than they do now.

There are buffers, timers, and parameters that are utilized within the TCP protocol. For example, when a packet is lost or delayed, certain timers force the packet to be resent. TCP optimization utilizes algorithms that leverage the ability to tune these variables and more based on the characteristics of the networks today.

TCP optimization can use packet loss algorithms like TCP Reno. They can also use bandwidth estimating algorithms such as TCP Westwood(+). Latency can be a factor in the tuning, so the TCP Vegas algorithm was developed. The ideal TCP optimization solutions will use all of these algorithms and other methods to provide the most efficient and reliable delivery mechanism for TCP traffic.

When we look at the networks of the mobile network providers, we see two distinct network profiles. On the Internet side of the network, we see very low latency, low jitter, minimal congestion, and essentially no packet loss. On the other hand, on the wireless radio side of the network where the consumer devices reside, there is high latency, higher congestion, and some packet loss can actually be considered normal.

The TCP optimization solution sits as a TCP proxy in between the two networks, usually on the S/Gi network between the PGW and the Internet. As a TCP proxy, the solution has the ability to tune the TCP characteristics of each side of the connection independently. This tuning, using public and proprietary algorithms can improve the delivery of content. TCP optimization reduces the latency and jitter of the traffic and improves the overall speed of the delivery of the information.

As congestion increases, the benefits of TCP optimization also increase. It has been shown that this technology can improve a typical consumer's download speeds over 243%. The benefits start to become obvious when one looks at the performance benefits and the cost savings by extending the capabilities of the service provider's core network.

For further information, I strongly recommend that you read the TCP Optimization Reference Architecture to learn more.

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