SANDVINE

TCP Optimization

Improve QoE by managing TCP-caused latency

TCP OPTIMIZATION DELIVERS:

Unique Approach
Creates a TCP "midpoint" that takes control of the TCP connection while remaining end-to-end transparent

Buffer Mangement
Manages "starving" and "bufferbloats" efficiently by adjusting the sending rate to correspond to the level of buffer data in the access network

Better Congestion Control
Service providers can delay other congestion management investments

Improved QoE
Faster data transmissions and increased application performance

Multipurpose Divert Node for Load Balancing
Single-box solution for DPI, traffic management (including divert), and analytics

Better Network Performance
Higher ratio of goodput to throughput, better resource utilization, reduced retransmissions, and extended investments lifetime

Competitive Advantage
Improved rankings for speed and overall performance, translating to better brand perception in the market

MARKET OVERVIEW

The Transmission Control Protocol (TCP) is the engine of the internet and its dominant role in traffic delivery has only grown as customers demand support for an ever-increasing array of personal, social, and business applications and services. However, TCP is not without its faults, and its well-known weaknesses have created a significant drag on network performance and customer quality of experience (QoE).

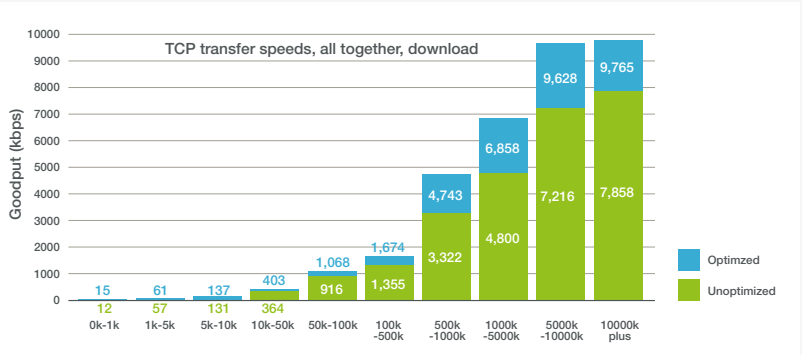
Given that TCP traffic represents ~90% on fixed and 90%+ on mobile networks, many service providers that have overlooked TCP's shortcomings in the past are now considering new ways to manage TCP traffic to increase its performance, service quality, and network utilization.

The very characteristics of TCP that made it very popular and successful led to its performance challenges in modern day networks. TCP is largely focused on providing fail-safe traffic delivery, but this reliability comes at a cost: lower performance, subpar customer experience, and underutilized network assets.

TCP is hobbled by its lack of end-to-end network visibility. Without the ability to see and adequately adapt to changing conditions, TCP slows down or accelerates traffic based on antiquated congestion management assumptions. TCP's limitations negatively impact network performance by being too slow to utilize available bandwidth, too fast to overload network buffers resulting in dropped packets and retransmits, and too focused on each specific traffic flow to more effectively manage the entirety of all traffic traversing a network link.

Figure 1

RAN Spectrum Optimization improved TCP transfer speeds by as much as 43% in this European 3G/4G network



USE CASE OVERVIEW

Sandvine's TCP Optimization use case minimizes the inefficiencies introduced by TCP so that all network types deliver a higher rate of goodput, over faster, more consistent, and predictable traffic flows. These improvements are achieved by lowering retransmission rates, by reducing the time to reach maximum throughput, by sustaining that throughput, and by better adapting to the packet loss and the congestion that occurs in the network's last miles.

Sandvine solves TCP-related issues on three major fronts:

- **Performance:** Goodput, defined as the payload without retransmissions, can be monitored by measuring the unique application data volume per TCP connection. By reducing the number of retransmits, the use case increases the ratio of goodput to throughput, delivering consistent and significant improvements in the amount of payload provided and the performance of the network services delivered.
- **Capacity:** TCP is slow to ramp-up to maximum available transmission rates. This occurs with each new TCP flow and, taken in aggregate, this TCP feature (aptly named "SlowStart") wastes available capacity, driving down network resource utilization rates. These rates decline even more when traffic travels over a long distance or in networks with more available bandwidth. The TCP Optimization use case reduces the time to reach available bandwidth by minimizing the latency between the subscriber/access network and the internet/transit network and by then applying techniques to optimize the performance of each 'side' of the connection.
- **Quality of Experience:** Sandvine improves QoE by accelerating TCP data transmissions and increasing application performance. The use case also minimizes the lag introduced into streaming and interactive applications when excessively buffered in last-mile networks.

From a pure network efficiency perspective, Sandvine's TCP Optimization improves TCP:

- When additional bandwidth is available, ensuring TCP doesn't become a bottleneck by accelerating the slow-start phase and by ensuring there is always enough data ready to be served.
- When too little bandwidth is available (e.g., caused by congestion, spotty mobile coverage, etc.), the use case reduces effective latency by preventing buffer-bloat in access network resources.
- By transparently bridging the access network with the transit network, sitting in a position to manage all the network's TCP connections as a collective whole ensures maximum efficiency.

Sandvine's TCP Optimization Key Capabilities:

Transparent Deployment

Acts as a bridge and doesn't terminate the TCP connection, so the acceleration is completely transparent to the endpoints.

Access Agnostic

Deploys in any type of access network, with any combination of access technologies (e.g., Cable, DSL, 3G, 4G, WiFi, Satellite, WiMAX, etc.). In mobile networks, TCP Accelerator even supports deployments in shared RAN environments with a Multi-Operator Core Network (MOCN).

Broad Traffic Optimization

Applies to all types of traffic, including uploads, downloads, all TCP-based applications (default configuration is application agnostic), encrypted traffic, and HTTP2.

Powerful Acceleration Techniques

Accelerates TCP using: two-side acceleration, reduced packet loss effect during slow-start, congestion control, fast retransmit, and improved retransmission.

Buffer Management

Prevents bufferbloat, buffer overflow, and latency-insensitive applications favored over latency-sensitive applications.

Distinct Profiles

Uses any ethernet, IP, or TCP header fields, such as IP ranges, TCP ports, etc., applying optimization profiles to specific traffic to manage high-bandwidth points of presence and low-bandwidth points of presence differently.

Historical Reports

Measures and records performance and statistics are logged for auditing or operational review.

Sandvine's TCP Optimization use case empowers service providers to take control of TCP traffic, improving performance and quality of TCP-based, network applications and services by accelerating throughput, using more of the capacity at hand, lowering retransmission rates, increasing goodput, and limiting latency. By deploying this use case, service providers reap the benefits of CAPEX savings, enhanced capacity, and improved QoE.

ABOUT SANDVINE

Sandvine's cloud-based Application and Network Intelligence portfolio helps customers deliver high quality, optimized experiences to consumers and enterprises. Customers use our solutions to analyze, optimize, and monetize application experiences using contextual machine learning-based insights and real-time actions. Market-leading classification of more than 95% of traffic across mobile and fixed networks by user, application, device, and location creates uniquely rich, real-time data that significantly enhances interactions between users and applications and drives revenues. For more information visit **http://www.sandvine.com** or follow Sandvine on Twitter **@Sandvine**.

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