SANDVINE

Intent-Based Congestion Management

Manage congestion based on network QoE targets for applications

INTENT-BASED CONGESTION MANAGEMENT DELIVERS:

- Responsive and precise congestion management based on real network conditions and optimal application QoE parameters

- Self-adjusting, automated solution, requiring minimal manual intervention

- Closed-loop automation for improved CAPEX and OPEX

- QoE-centric approach for improved network performance from the customer perspective, preventing high customer call volumes and churn

MARKET OVERVIEW

Fixed and fixed wireless access technologies and data speeds have advanced significantly over the last several years, but growing penetration of digital devices in homes, expanding online video consumption, and increasing at-home usage trends have made fixed access networks more vulnerable to congestion.

Network congestion occurs when demand for a resource exceeds capacity and can occur at different segments of the network. It is critical to know the exact source and location of the congestion in order to apply subscriber- and topology-aware management techniques. It can occur in either direction, depending on demand, traffic characteristics, and the amount of network capacity available.

For operators, expanding capacity sounds like a simple answer, but only serves to defer the problem. In fact, usage patterns always evolve to fill the bandwidth capacity gap created by the capital expenditure.

Typically, congestion follows peak-hour network trends, which must be weighed against the standard overprovisioning of the network. The congestion impacts not only the QoE for contributing users, but other lower-volume users as well – those whose low throughput applications get queued up. Unmanaged congestion will impact QoE, which results in unsatisfied customers and a higher churn rate.

Specifically, users expect to have a reliable connection with low latency and high throughput, with little downtime or interruptions when engaging in their daily active use. When these expectations are not met and there is a perceived degradation in service quality, customers call support. The starting assumption is QoE degradation can be attributed to the operator's network – regardless of whether it is congestion, misconfiguration, or related to anything in the customer's home/sphere of control.

Traditional existing congestion solutions only provide static policies, requiring manual fine tuning to get the parameters correct for the specific network conditions – which change on a minute-by-minute basis. Static allocation of bandwidth resources isn't an effective approach to deal with the dynamic nature of traffic demands and the applications, and can in fact unnecessarily degrade the QoE of a network, causing more problems than it solves.

Network operators need a solution that is dynamic in nature and reduces the burden on manual intervention to adjust to rapidly evolving network conditions.

SOLUTION OVERVIEW

Sandvine's closed-loop automation use case arms fixed and fixed wireless operators with an intelligent approach to managing network congestion based on intended application performance. Intent-Based Congestion Management sets a minimum and target QoE for each application or service category, preventing poor performance while also ensuring better allocation of bandwidth during congestion. It relies on constant network monitoring to detect network congestion and leverages dynamic shaping to deliver a self-adjusting, automated solution (Figure 1).

Figure 1

Service Category Scoring and Dynamic Shaping
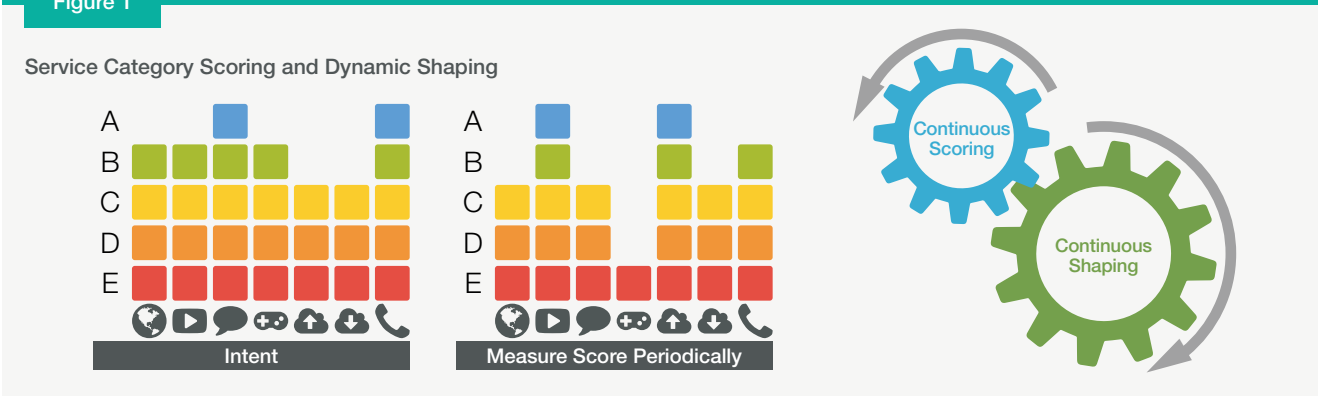
Traditional network management approaches include prioritizing some essential protocols (e.g., DNS), prioritizing service plans or networks, or allocating a percentage of a network link to specific applications or protocols. These approaches all require manual investigation, configuration, and monitoring to ensure the solution continues to correctly manage congestion as designed.

Sandvine's Intent-Based Congestion Management solution removes those manual steps and makes it possible to manage a network simply by identifying the intended performance. It is based on:

Real-Time Responsiveness

Identifying the source of network congestion, whether a new heavy user, influx of users, or a popular online game update, is critical. Sandvine's Intent-Based Congestion Management solution reacts to any of these scenarios automatically, adapting management approach to hold true to the intended behavior of the network – without additional configuration.

Greater Degree of Control

Sandvine's solution (**Figure 2**) expands the standard toolkit of managing services and applications, defining behavior and service plans, and setting shaping objects per link. Operators can define intended behavior between categories and then the solution enforces this across each network locations.

Figure 2
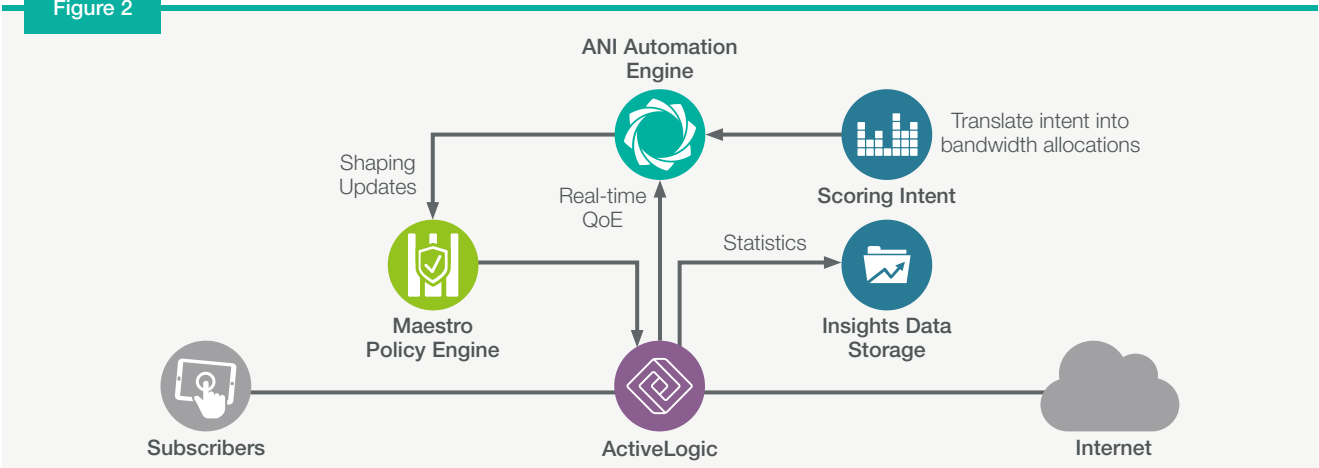
Advanced Precision

Intent-Based Congestion Management goes beyond basic bandwidth allocation as a metric for a management solution. Allocating more bandwidth to a user or application may not necessarily increase the quality of experience. Sandvine's Intent-Based Congestion Management implements a closed-loop operation, whereby the output QoE per service category reaches the target QoE objectives set for that service class. It allows for improved user QoE across applications, despite dynamic traffic variations. Even when congestion is present in the network, the intended QoE for target applications can be protected.

Straightforward Deployment

This use case is able to take the single intent for network behavior and apply it to congested locations with different user density, backhaul link size, access node vendors, access configurations, etc. These network parameters are learned by the solution and the management is adapted accordingly. No device firmware or software, special protocols or additional network probes required. Intent-Based Congestion Management leverages a network operator's existing Sandvine infrastructure and as a result, the solution can be implemented and launched rapidly – network-wide or across a large number of nodes.

Sandvine's Intent-Based Congestion Management revolves around QoE and defining appropriate and desired levels for service categories, and all applications or services can be mapped to service categories. For DNS or other critical infrastructure traffic, a minimum bandwidth floor can be allocated.

Each service category will have a target QoE and a minimum QoE that must be maintained (**Figure 3**). The minimum and the target QoE represent the business goal or the intended network performance, which is then enforced by a closed-loop system based on what the current network capacity will allow.

Figure 3

Intent-Based Congestion Management Overview Dashboard. Sandvine's scoring methodology is used to set, adjust, and manage QoE targets
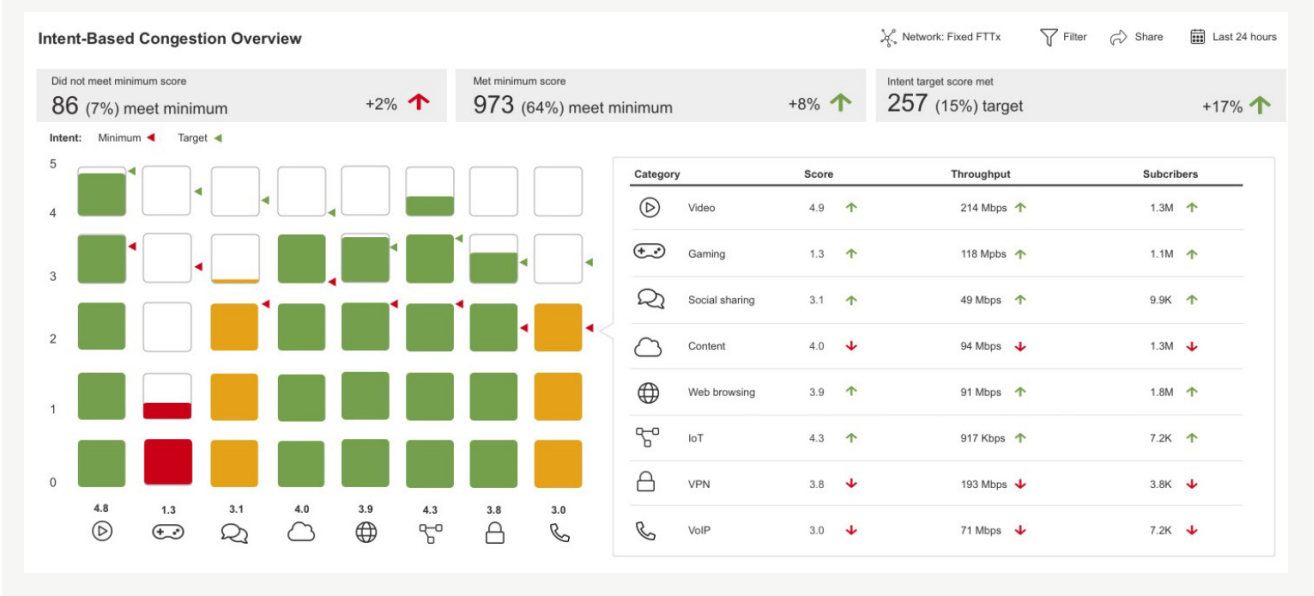
Sandvine's Intent-Based Congestion algorithm dynamically determines the bandwidth allocation per service category and measures the user QoE per service category after each iteration. Necessary adjustments are made to either apply stricter enforcement to some categories, or provide relief to others, as necessary to meet the desired intent. If the minimum QoE is unable to be met, it is an indication of saturation within that network location and the operator can use this when reviewing capacity planning.

With Sandvine's Intent-Based Congestion Management solution allows operators to benefit from precise management, better QoE, improved infrastructure lifetime, and reduced churn.

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