AppLogic NETWORKS

Fair Usage and Congestion Management

Precisely manage congestion, extend infrastructure lifecycle, and protect QoE

THIS USE CASE DELIVERS:

Application Awareness
Delivering the industry's best application identification with the largest and most precise library of application signatures. Application awareness is an important dimension to consider and manage to ensure better customer experience in cases where congestion does occur.

Flexible Policy and Traffic Management
Enabling real-time policy control on a per-user basis across multiple context and service dimensions. Flexible policy and traffic management allows for powerful and agile policy management with multiple inputs from different sources.

Network Neutrality Compliant Management Techniques
Empowering service providers with flexible and feature-rich congestion management, allowing them to choose the traffic management policies that fit the network neutrality requirements of their particular regions.

QoE Trend Monitoring
Providing analytical tools, such as ScoreCard, which measures the QoE delivered across key traffic, users, and other dimensions. These analytics help service providers worldwide track their quality and identify areas where more attention or investment may be needed.

MARKET OVERVIEW

Congestion is an ongoing network issue for every service provider, regardless of the size or access technology. Concerns about how to manage it shows no signs of abating for the foreseeable future. Network congestion occurs when demands for resources exceed resource capacity and that capacity is bounded by two overriding factors: the investment required to expand capacity and the quality of experience (QoE) delivered to customers.

Theoretically speaking, networks are designed to be responsive to customer and user traffic requirements, to handle peak loads, and to provide reasonable returns on investments. However, the reality is that networks cannot be economically built to deliver against all potential future requirements because customers can present rapidly changing needs; peak loads can vary wildly, return on investment (ROI) and budget projections can falter in the face of competitive pricing pressures, and other business-related issues.

To add another layer of complexity, service providers, depending on the market, are also subject to the regulations imposed on them by regulatory bodies on what is deemed "reasonable" traffic management. Specifically, service providers must only apply traffic management policies during congestion periods and ensure that all users have equal access to bandwidth or are allocated bandwidth according to their service-level agreements with transparency.

Service providers need a solution that delivers more with less, stretching capital and operational resources without impacting QoE, while also complying with regulations.

USE CASE OVERVIEW

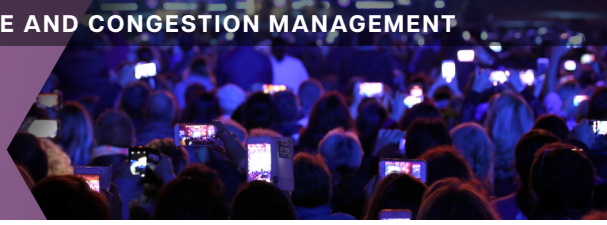
Congestion management may take many forms. Service providers can analyze historical trends for planning purposes, but this approach is not helpful as a method for responding to real-time network congestion issues, which require dynamic and automated actions rather than static rules and manual actions.

AppLogic Networks takes a more dynamic approach to managing congestion, combining traffic management with policies that are triggered when and where needed. The Use Case provides far more precise and effective congestion management based on a much broader set of conditions, which can include:

- Priority by application or application type, content type, by source or destination, and by network type
- Personalized subscriber-related attributes such as recent usage, service plan, and type of device
- Real-time monitoring of QoE metrics at locations throughout the network, which can then inform actions to maintain specified quality levels

Ultimately, AppLogic Networks' solution for managing congestion is centered on the notion of fair use and access to network resources. Even for policies that may favor a higher-ARPU customer, there is still a fair use compliance.

Fair Usage and Congestion Management



FAIR USAGE AND CONGESTION MAGAGEMENT BY ACCESS TECHNOLOGY

AppLogic Networks' Fair Usage and Congestion Management works across all network access types. It includes unique, network-specific features tailored for even more effective congestion management within mobile, cable, satellite, DSL/FTTx, or WiFi networks. The use case can also operate in conjunction with network neutrality traffic management guidelines, such as only shaping traffic when congestion is detected or for application classes rather than for specific applications.

Although Fair Usage and Congestion Management is a foundational use case within the Network Optimization solution, it also seamlessly integrates with other use cases, including the following: Heavy User Management, Video Streaming Management, Wholesale and Peering Link Management, and Usage-Based Services.

Mobile Networks

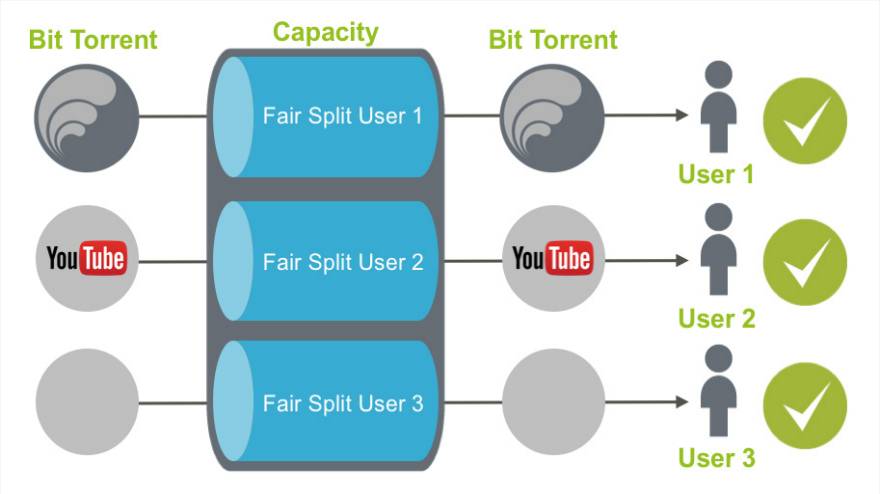
Mobile network performance is highly visible and mobile traffic is growing at rates that outpace the growth of all other network traffic types. Service providers are experiencing the challenge of building out their networks fast enough to keep up with demand. Clearly, there is a great need to stretch the mobile resources already deployed and to have the tools to better manage the QoE that customers receive.

Mobile network congestion is unique in many ways. Specifically, mobile users aren't stationary, so demand for throughput may vary greatly by conditions such as time of day, weather, device type, applications, and more. Ironically, a stationary mobile technology that requires attention is FWA - Fixed Wireless Access. This creates even more challenges in managing congestion.

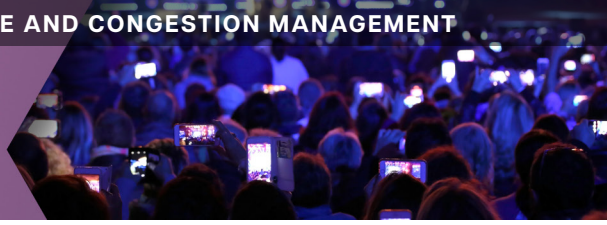
Service providers use network congestion management to avoid or delay upgrades to their capacity and need to pick the right strategy depending on the root cause of congestion. For example, if the main congestion issue is that traffic is not equitably provided across subscribers, fair use policies are likely to provide more immediate, positive outcomes than would the addition of more mobile capacity.

Figure 1

Fair Split ensures fairness among all active subscribers



Fair Usage and Congestion Management



Key capabilities include:

- QualityGuard Congestion Response System for RAN performance metrics, incorporating real-time mapping of subscribers to their RAN locations to maximize network utilization and QoE
- Congestion detection at the cell or the base station level
- Handheld device identification to personalize and optimize content at the device level
- Real-time QoE scoring to identify trouble areas in the RAN network
- 3GPP-compliant policy control and charging interfaces for rapid integration with Policy Control Enforcement Functions (PCEFs) or Policy and Charging Rules Functions (PCRFs)

Cable Networks

Cable networks are broadly deployed and are a leading method for delivering broadband fixed access to the home. Cable speeds are impressive, with the latest standards supporting gigabit and multi-gigabit speeds. Yet even with such impressive top-end speeds, traffic congestion remains a problem because, like all broadly deployed networks, cable networks are shared resources and cable service providers have to look for promising returns on their network investment.

Cable networks adhere to the Packet Cable Multimedia (PCMM) standard, which includes rudimentary quality of service (QoS) capabilities. PCMM-based QoS is based purely on layer 3 information, which is not application aware and not capable of effective congestion management. AppLogic Networks' cable congestion management solution augments PCMM QoS with an advanced policy management platform that enables cable service providers to deliver dynamic, real-time QoS on a per-user, per-application basis.

Key capabilities include:

- Video and heavy user bandwidth management for low speed plans
- Topology mapping, matching users and their traffic to all potential cable modem termination system (CMTS) interfaces, calculating channel and bonding group supersets to apply highly granular congestion management
- Integration of CMTS's IPDR, PacketCable Multimedia (PCMM), and SNMP interfaces provide much richer visibility into the network and a more flexible policy enforcement of upstream and downstream traffic
- Minimum rate threshold shaper, allowing service providers to guarantee a minimum bandwidth for traffic as a percentage of the CMTS interface speed
- Real-time QoE scoring to identify suffering users, by location, in the cable network
- Fully compliant to DOCSIS 1, 2, 3, 4, and other relevant CableLabs standards, including IPDR, PCMM, and SNMP for vendor agnostic support for industry leading CMTS vendors

Satellite Networks

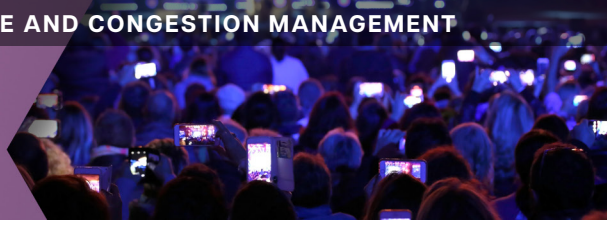
Satellite networks have several unique, congestion management challenges based on their reliance on limited beam bandwidth, their extreme round-trip and traffic latency times that can approach 500 milliseconds, and their TCP timestamps, which are often obscured by isolated, end-to-end acceleration systems.

With the AppLogic Networks solution, you get the most out of the available beam capacity, maintain customers' bandwidth service-level agreements across the footprint, manage congestion at the subscriber, application, and beam level, and enforce fair use policies in real time.

Key capabilities include:

- Support for multi-layered shaping schemes that map to various network entities (e.g., beam capacity, application committed rate, per-user limit) to effectively allocate resources
- Third-party mobility manager integration to mirror topology changes in real time when user terminals are reassigned to different beams

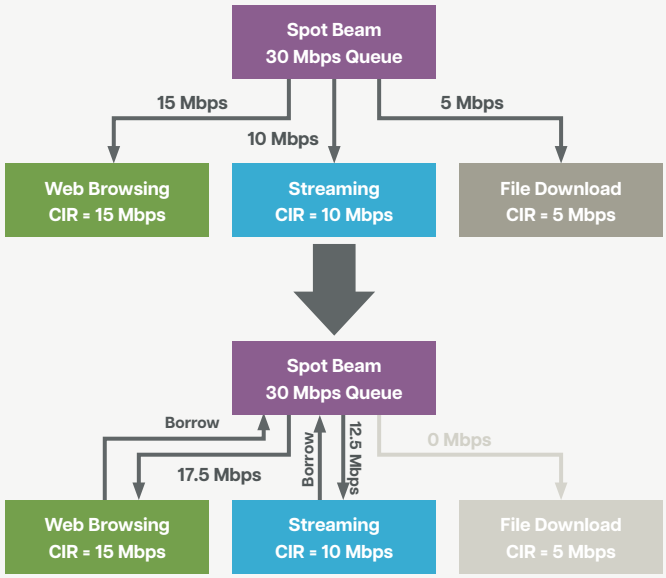
Fair Usage and Congestion Management



- Hierarchical queues that allow for the borrowing of bandwidth to accommodate traffic rates that go well beyond committed information rates
- TCP Optimization integration for reduced latency and smoother management of TCP-based traffic
- Traffic prioritization based on user class – passenger, crew – and application
- Tiered service structure in conjunction with sophisticated congestion management algorithms that enable a broader set of offerings and price points to maximize value

Figure 2

Guaranteeing committed information rates



In **Figure 2** (above), bandwidth borrowing allows service providers to implement a series of hierarchical queues, where each child queue is guaranteed a committed information rate. Here the spot beam represents the parent queue, and the child queues represent sub-elements utilizing the beam, such as, an application group, an aircraft, a sea vessel, or end users.

WiFi Networks

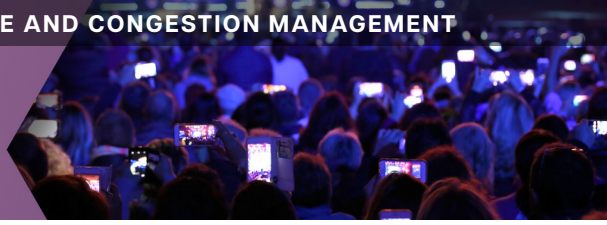
WiFi access technology has become crucial for service providers because it now acts as the primary network extension to cellular networks, providing welcome relief to overburdened RANs. WiFi is also considered essential in public venues like airports and stadiums, which are usually designated offloading sites for service providers as well. Despite the fact that WiFi is often provided free of charge, consumers consider it an essential utility and expect good quality WiFi connections.

WiFi congestion management is largely different from that of other access networks in that it is applied at the access point (AP), site router, and wireless LAN controller (WLC) levels. This hierarchy is important because it is at these three levels that congestion management can be applied, providing the contextual awareness (subscribers mapped to AP, site router, or WLC) needed for critical performance intelligence and follow-up actions.

Key capabilities include:

- Completely vendor agnostic and can be integrated with any WiFi vendor's AP and WLC
- Deployments can be centralized or decentralized (network or cloud-based), and the features remain consistent across all deployment models

Fair Usage and Congestion Management



- Data can be integrated with network operation tools for automated alerts and ticket generation
- AppLogic Networks analytics can provide per-user scoring for a localized view of WiFi network performance, exposing hotspots, and coverage holes
- Broad application signature database allows the service provider to uniquely identify application groups and individual applications for deeper insight into usage behavior
- Application-level traffic prioritization (based on subscriber-identified virtual services)
- Fair use management balances traffic equitably amongst users, allowing the service provider to better manage customer experience during times of congestion

DSL/FTTx Networks

The last several years has brought significant advancement to fiber and DSL technologies along with the high-speed services running over them. However, in spite of these upgrades, DSL/FTTx networks are still highly vulnerable to congestion – upstream and downstream – due to the growing penetration of digital and IoT devices as well as the onslaught of high-definition video and gaming.

For fixed service providers, the cost of augmenting current capacity is incredibly expensive and the process of laying cable is labor-intensive. This high cost is a deterrent for many fixed service providers and they often just resort to oversubscription as a way to manage congestion; while effective in the short-term, it has a serious implication to service-level agreements and the QoE delivered to users.

Key capabilities include:

- Traffic prioritization for business/customer-critical applications and traffic types when a network location is operating with limited resources
- Systematic management for congestion-related issues versus oversubscription, as the actual available capacity of a network resource is dynamic rather than constant
- Precise and intelligent congestion management: user aware, uplink/downlink direction aware, tier/plan aware, and topology aware (up to BRAS circuit, PON port and Bit Stream links)
- Vendor- and technology-agnostic solution to easily integrate in multi-vendor deployments, which are highly common with lower CAPEX and TCO
- Multi-dimensional approach that works proactively against developing congestion pattern and only acts on genuine congestion situations
- Peering link traffic prioritization, which allows converged service providers, sharing common internet links, to manage traffic (based on access technology) as per business intent

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